SOME EFFECTS OF OPTOKINETIC TRAINING ON OPENNESS OF THE PERCEPTUAL FIELD

By

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TO BELINDA AND THE OTHERS

Truly adequate people possess perceptual fields maximally open to experience. That is to say, their perceptual fields are capable of change and adjustment in such a fashion as to make fullest possible use of their experience.

A greater openness to experience offers many advantages. It provides adequate people with more data and, with more data, they are much more likely to be right.

The individual who is open to his experience has a wider source of data from which to select his perceptions. Yet openness . . . is learned from experience, and what is learned can be taught. Education can help people to learn to be more open to their experience. A basic goal of education itself must be the production of increased openness. What narrows and rigidifies human experience is antithetical to education.

(Combs, 1962 ASCD Yearbook)

We have changed the world so much that unless we make interior changes we'll soon be in serious trouble.

(Cohen, The Beyond Within)

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.	ii
LIST OF TABLES.	vi
LIST OF FIGURES	x
CHAPTER I	
INTRODUCTION AND STATEMENT OF THE PROBLEM.	1
Introduction.	1
Statement of the Problem.	10
CHAPTER II	
REVIEW OF RELATED RESEARCH	14
Introduction.	14
Research Related to Perceptual Learning.	14
Research Related to Perceptual Style	20
Scanning.	22
Research Related to the Dimensions of the Present Study Orienting Response.	24
Eye Movements	25
Optokinetic Nystagmus	27
After-effect of Apparent Movement . .	30
Summary and Implications for the Present Study	31
CHAPTER III	
EXPERIMENTAL DESIGN OF THE STUDY	33
Theoretical Framework	33
Definition of Terms.	35
Statement of Hypothesis	36
Optokinetic Training.	36
The Perceptual Speed Task	39
The Closure Flexibility Task.	42

Page

The Perceptual (Picture) Differentiation Task. 44
Design of the Research. 46
The Sample. 47
Experimental Procedures 48
Treatment of Data 50

CHAPTER IV

STATISTICAL ANALYSIS AND DISCUSSION OF THE RESULTS 52

Introduction. 52
Performance on the Perceptual Speed Task. 54
Performance on the Closure Flexibility Task. 61
Performance on the Picture Differentiation Task. 68
Intercorrelation Analysis 76
Discussion. 77
Summary 82

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS 84

Summary 84
Conclusions 87
Implications. 88

APPENDIX A

Instructions for Administering Experimental Procedures (Group A) 94

APPENDIX B

Instructions for Administering Experimental Procedures (Group B) 98

APPENDIX C

Instructions for Administering Experimental Procedures (Group C) 102

APPENDIX D

Instructions for Administering Experimental Procedures (Group D) 105

Page

APPENDIX E

Directions for Perceptual Speed Test and Sample Items. 108

APPENDIX F

Directions for Closure Flexibility Test and Sample Items 111

APPENDIX G

Directions for the Picture Differentiation Task and Sample Picture 114

APPENDIX H

Descriptive and Experimental Data. 116

APPENDIX I

Supplementary Statistical Analysis Summary Tables. 120

REFERENCES 129

BIOGRAPHICAL SKETCH. 136

LIST OF TABLES

Table		Page
1	EXPERIMENTAL TREATMENT GROUPS AND PROCEDURES.	49
2	PRETEST PERCEPTUAL SPEED TASK MEANS AND STANDARD DEVIATIONS (GROUPS A AND B).	55
3	PRETEST PERCEPTUAL SPEED TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A AND B).	55
4	POSTTEST PERCEPTUAL SPEED TASK MEANS AND STANDARD DEVIATIONS (GROUPS A, B, C, D)	56
5	POSTTEST PERCEPTUAL SPEED TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A, B, C, AND D)	57
6	DUNCAN'S NEW MULTIPLE-RANGE TEST SHOWING SIGNIFICANT MEAN COMPARISONS FOR PERCEPTUAL SPEED TASK (GROUPS A, B, C, AND D).	58
7	ANALYSIS OF VARIANCE SUMMARY TABLE PRE- AND POSTTEST PERCEPTUAL SPEED TASK (GROUPS A AND B)	59
8	MANN-WHITNEY U TEST FOR GAIN SCORES ON PERCEPTUAL SPEED TASK (GROUPS A AND B).	61
9	PRETEST CLOSURE FLEXIBILITY TASK MEANS AND STANDARD DEVIATIONS (GROUPS A AND B).	62
10	PRETEST CLOSURE FLEXIBILITY TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A AND B).	62

Table		Page
11	POSTTEST CLOSURE FLEXIBILITY TASK MEANS AND STANDARD DEVIATIONS (GROUPS A, B, C, AND D).	63
12	POSTTEST CLOSURE FLEXIBILITY TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A, B, C, AND D).	64
13	DUNCAN'S NEW MULTIPLE-RANGE TEST SHOWING SIGNIFICANT MEAN COMPARISONS FOR POSTTEST CLOSURE FLEXIBILITY TASK (GROUPS A, B, C, AND D).	65
14	ANALYSIS OF VARIANCE SUMMARY TABLE PRE- AND POSTTEST CLOSURE FLEXIBILITY TASK (GROUPS A AND B).	66
15	MANN-WHITNEY U TEST FOR GAIN SCORES ON CLOSURE FLEXIBILITY TASK (GROUPS A AND B)	67
16	PRETEST PICTURE DIFFERENTIATION TASK MEANS AND STANDARD DEVIATIONS (GROUPS AND B)	69
17	ANALYSIS OF VARIANCE SUMMARY TABLE FOR GROUPS A AND B, LIST AND TEXT PRETEST PICTURE DIFFERENTIATION TASK	69
18	MEANS AND STANDARD DEVIATIONS FOR POSTTEST PICTURE DIFFERENTIATION TASK (ALL GROUPS).	71
19	ANALYSIS OF VARIANCE SUMMARY TABLE FOR GROUPS A, B, C, AND D LIST AND TEXT POSTTEST PICTURE DIFFERENTIATION TASK	72
20	MANN-WHITNEY U TEST FOR GROUPS A AND B GAIN SCORES ON PICTURE DIFFERENTIATION TASK	73
21	MANN-WHITNEY U TEST FOR PICTURE DIFFERENTIATION PRE-POST GAIN SCORES GROUPS A AND B (LIST)	74

Table		Page
22	MANN-WHITNEY U TEST PICTURE DIFFERENTIATION TASK GROUPS A AND B PRE-POST GAIN SCORES (TEXT).	75
23	DESCRIPTION OF THE SAMPLE	117
24	EXPERIMENTAL DATA SUMMARY TABLE GROUP A AND B	118
25	EXPERIMENTAL DATA SUMMARY TABLE GROUP C AND D	119
26	RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PERCEPTUAL SPEED TASK GROUPS A AND B	121
27	RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE CLOSURE FLEXIBILITY TASK GROUPS A AND B . .	122
28	OVERALL N'S, MEANS, AND STANDARD DEVIATIONS PRETEST PICTURE DIFFERENTIATION TASK.	123
29	OVERALL N'S, MEANS, AND STANDARD DEVIATIONS POSTTEST PICTURE DIFFERENTIATION TASK ALL GROUPS . .	123
30	RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B	124
31	RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B (LIST). 125	
32	RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B (TEXT).	126
33	MEANS AND STANDARD DEVIATIONS FOR PRE- AND POSTTEST PERCEPTUAL SPEED, CLOSURE FLEXIBILITY AND PICTURE DIFFERENTIATION VARIABLES	127

Table | Page

34 INTERCORRELATIONS OF PRE- AND POSTTEST PERCEPTUAL SPEED, CLOSURE FLEXIBILITY, AND PICTURE DIFFERENTIATION VARIABLES (Pretest N = 20; Posttest N = 40). 128

LIST OF FIGURES

Figure		Page
1	Optokinetic Perceptual Learning Device and Subject.	38
2	Perceptual Speed Test Sample Items. . . .	110
3	Perceptual Differentiation Task Sample Picture.	114

CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

"What can man become? What is the ultimate in human freedom? What does it mean for man to achieve the fullest possible fulfillment of his potentialities?" (Combs, 1965, p. 562). Answers to these and similar questions are increasingly being sought by searchers and researchers in all areas of human concern. Pioneers such as Maslow, Rogers, Combs, and others have contributed much to the understanding and exploration of the "human" frontier. A "humanistic revolution" is now in evidence as individuals throughout the world are expressing a passionate plea for respect and a chance to fulfill their potential as human beings. It is increasingly imperative that their plea be answered by the use of every possible means for the development of human potential. Indeed, "the freedom to do one's unique best within the context of mankind as an evolving whole" (Hubbard, 1968, p. 1) is the deepest human need of this age.

Currently there are three basic psychological frames of reference. The first frame of reference or force in psychology emphasizes behavioristic theory; second force, classical psychoanalytic theory; and third force, humanistic

psychology. Humanistic psychology grew from the need for greater actualization of human potential. Sutich (1968) announced the emergence of "Transpersonal psychology," composed of psychologists and other professional persons who are deeply interested in extending humanistic psychology to include a greater emphasis on ultimate human capacities and potentialities.

In exploring the question of man's ultimate capacities, one avenue of discovery begins with asking "what does it mean to be a fully functioning person, operating at the highest peak of his potentialities? What does it mean to be self-actualizing, self-realizing, a truly adequate person in the fullest possible sense of the word?" (Combs, 1965, p. 561). To answer these questions a good deal of literature and research has been devoted to studying the adequate, healthy, fully-functioning and self-actualizing persons found in society today as well as in accounts of historical figures. This chapter is devoted to looking at some of the answers to these questions, some of the approaches that are being used to enhance the actualization of human potential, and a new approach, optokinetic training.

In looking at the behavior of truly adequate persons, Combs has found the following four characteristics of their perceptual fields: (1) a positive view of self; (2) identification with others; (3) openness to experience and acceptance; and (4) a rich and available perceptual field (1962, p. 51). Thus, in order to develop adequate persons

it seems reasonable to suppose that the provision of experiences which encourage the development of these characteristics might be a profitable approach. The present study will focus on providing a perceptual experience aimed at increasing perceptual openness.

Maslow felt "that the concept of creativeness and the concept of the healthy, self-actualizing, fully-human person seem to be coming closer and closer together, and may perhaps turn out to be the same thing" (1967, p. 43). Rogers also described the fully-functioning person as a creative person. "With his sensitive openness to his world, and his trust of his own ability to form new relationships with his environment, he is the type of person from whom creative products and creative living emerge" (1962, p. 141). Rogers found the fully-functioning person to be sensitively open to all his experiences. In reviewing the literature, one is repeatedly struck by the fact that openness to experience seems to be an important characteristic of creativity and human achievement.

Combs observed that truly adequate persons have (1) perceptual fields capable of change and adjustment in such fashion as to make fullest possible use of their experience; (2) the capacity to accept into awareness any and all aspects of reality; and (3) less necessity to defend or distort their perceptions to fit existing patterns. In short, "their perceptual fields are maximally open and receptive to their experiences" (1962, p. 56).

Openness to experience is defined by Combs (1962, p. 56) as the ability to admit evidence into awareness. The person who is open to his experiences is characterized by Rogers (1959, p. 75) as having a lack of rigidity; a tolerance for ambiguity; and the ability to receive much conflicting information into awareness without forcing closure upon the situation. When one is open to his experience,

> every stimulus, whether originating within the organism or in the environment, would be freely relayed through the nervous system without being distorted by a defensive mechanism. . . .whether the stimulus was the impact of a configuration of form, color, or sound in the environment on the sensory nerves, or a memory trace from the past, or a visceral sensation of fear or pleasure or disgust, the person would be "living it," would have it completely available to awareness (Rogers, 1962, p. 23).

"This kind of openness is almost child-like in character. It represents a kind of naivete, a type of wide-eyed wonder which permits the world to come in, to be whatever it is . . ." (Combs, Purkey, and Avila, 1968). Maslow describes this perceptual mode as "Taoistic Receptivity," a quality of letting-be and noninterference, or of "letting things happen" (Maslow, 1967, p. 49). This innocence of perceiving and behaving seems akin to the aesthetic, open mode of perception similar to the listener of music (Jourard, 1968).

But as the growing child learns to experience and see the world through the eyes of his culture, he gradually surrenders his individualistic outlook, becoming less ori-

ginal, less open to new experiences, and, consequently, less imaginative (Krippner, 1968, p. 53). This lessening of imaginative responses has often been noticed by teachers and others working with elementary school children. As Combs et al. expressed, "it is sad to be so firmly a prisoner of our pre-conceptions but, fortunately, the capacity for openness we possessed as children can be recaptured if one is willing to work at it . . ." (1968).

Some persons by virtue of their inherent curiosity and perceptual openness have quite naturally explored new ways of perceiving. History is replete with instances of such personal experiments in perceiving which were reported by the great and creative minds of the past. A modern report of such openness to experience was described by "Joanna Field," pseudonym of a British psychoanalyst, as she tells of her discovery of multiple ways of perceiving, ways that she found to be controllable by what she called an "internal gesture of the mind." She explored new ways of looking and listening and felt that her awareness had somehow widened and that she could widen or narrow her beam of attention as she chose (Field, 1955).

Because openness is not an innate characteristic, but is learned (Combs, 1962, p. 58), it follows that various kinds of experiences can be provided in order to increase perceptual openness. Perceptions can be changed through providing new kinds of experience which will produce new kinds of perceiving and through the deliberate breaking out

from accustomed patterns (Combs and Snygg, 1959, p. 356).

Changing perceptions through enriched experiences: The following are approaches being used in an attempt to provide new kinds of experiences which will facilitate this breaking out from accustomed patterns and so increase openness to experience and awareness. Schutz advocates the training of the total being for the full development of personal functioning.

> The parts of the body may be taught and trained, exercised and sharpened. The senses may be made more acute to discriminate smells and sights. Strength and stamina can be increased in the muscles. Sensory awareness and appreciation can be awakened so that more sensitivity to bodily feelings and natural events can be developed. Motor control can be cultivated so that development of mechanical and artistic skills result, and coordination and dexterity improve. The nervous system can be developed through study and the acquisition of knowledge and experience. Logical thinking and the creative potential can be nurtured and brought to fruition. Bodily functions controlling the emotions can also be developed. Awareness of emotions, appropriate expression of feelings (and their relation to other functions such as thinking and action) can be trained (1967, p. 17-18).

Some persons have experienced increased sensitivity and awareness through either spontaneously or purposively attacking various states of consciousness. The perceptual experiences of the sensory deprivation subjects, altered consciousness by psychedelic chemicals, delirium of the desperately ill, mystic and peak experiences, dreams of normal sleep and reverie, altered consciousness through practice of contemplative meditation, reports of remarkable perceptions achieved through the practice of various forms

of Yoga, Gestalt therapy exercises of bodily awareness training, sensory awakening experiences, fasting and ascetism, and the practices of Zen Buddhism all include as a common element "openness of awareness beyond the bounds of our heavily conditioned, daily perceptual limits" (Bugental, 1965, p. 231; Harman, 1967; Deikman, 1963; Otto, 1968).

Aaronson has altered perceptual experience through the medium of hypnotic suggestion. He found that "by changing the way in which the individual perceived the world--his depth perception, time perception, movement perception, color perception, and so on" (Aaronson, 1966 cited in Wohlwill, 1966) there would be major behavior changes. Even autohypnosis with which Zen meditation is sometimes compared "can lead to increased concentration, a focusing of attention, and an increased receptivity to creative ideas" (Krippner, 1968, p. 50).

Other approaches to enhancing perceptual openness are grouped under the rubric of sensitivity training. Sensitivity training commonly called T-groups, encounter groups, marathon groups, etc., are composed of six to twelve people meeting together for the primary purpose of personal growth. Some of the group interactions are essentially verbal interactions while others include a variety of creative techniques for group and individual self-exploration and growth. Psychodrama is another approach to sensitivity training and self-understanding. Centers such as Esalen Institute,

Western Behavioral Sciences Institute, National Training Laboratories, Kairos, Graduate School of Business (U.C.L.A.), and others scattered throughout the country constitute part of what Maslow called "the eupsychian network" because they are "all interested in helping the individual grow toward fuller humanness, and in helping the society grow toward synergy and health . . ." (1968, p. 12).

The area of perceptual learning and training is another approach to exploring and increasing perceptual openness and awareness, but characterized by a bit more scientific rigor. Perceptual learning is defined by Gibson as "any relatively permanent and consistent change in the perception of a stimulus array, following practice or experience with this array . . ." (Gibson, 1963, p. 29). Perceptual training experiments cover a variety of sensory modes. For example, training visual perception was pioneered by Samuel Renshaw using the tachistoscope to train form recognition. During World War II, increase in visual skill as measured by decreased perceiving time and correct reproduction was of survival significance. During his research with college students, Renshaw observed that they could be "trained to perceive visual forms at a level of skill which . . . may be classed as 'genius' . . ." (1945, p. 219).

Environmental enrichment studies are currently being conducted with children and lower animals. Research with lower animals shows the developmental potential of a perceptually enriched environment as seen in changes in cortex

thickness, RNA content, biochemical composition, and brain weight per body weight in favor of the animals raised in the more perceptually stimulating environment. Studies with human infants are being conducted such as Gordon's "parent education approach to the provision of early stimulation for the culturally disadvantaged" (1967).

Another way of enhancing the development of perceptual openness stems from the fact that openness to experience is learned partly from association with courageous, open people and by learning how "to accept oneself from having been accepted by significant people" (Combs, 1965, p. 78). Therefore, ideally all helping relationships (teaching, counseling, psychotherapy, etc.) should encourage and foster such liberating, openning experiences. "Education can help people learn to be more open to their experience. A basic goal of education itself must be the production of increased openness" (Combs, 1962, p. 143).

> Self-realization, enlightenment, creativity, self-actualization, spiritual development, being authentic, fully-functioning--in the end these come mainly to a single essence, to be aware and to respond: to become aware, from one's own immanent experience, that we are elements of a greater whole and that one has the choice of responding, or saying "yes" to life with the whole of his being, or being responsible (response-able)--and so to choose, and thereby to taste of freedom, to know the origins of love, to find the essence of wisdom, to become authentically man (Harman, 1967, p. 331).

In summary, the need for fulfillment has been described by a number of writers as the fundamental and basic need for the human being. In the sense that self-actualization and

individual success are found in achieving fulfillment, it becomes the very center of the reason for his being. People vary in the degree to which they have been able to actualize their potential. Multiple methods for fostering the actualization of human potential are currently being tried. The purpose of the present study was the investigation of optokinetic training as a possible addition to the growing repertoire of perceptual experiences aimed at actualizing human potential and particularly the essential capacity for perceptual openness.

Statement of the Problem

The problem stems from the fact the "since perceptions are the product of experience, there in no more fruitful way of affecting or changing perception than through the medium of some kind of new experience" (Combs and Snygg, 1959, p. 355). The process of telling is an experience which is facilitated by the provision of other perceptual experiences and "although individuals can seldom change their perceptions directly, it is possible for us to make changes in the ways in which we perceive through the kinds of experiences we seek" (Combs and Snygg, 1959, p. 355).

Since openness of the perceptual field is a function of previous perceptual experiences, a fruitful way to alter this relationship is to provide a unique perceptual experience. Therefore, the purpose of this study was to examine

some of the effects of optokinetic training on openness of the perceptual field in order to determine whether participation in an experience like optokinetic training was likely to result in increased perceptual openness and sharpened awareness. Although perceptual openness is a global concept, and the present study could sample only a limited portion of the individual's perceptual field, it was possible by measuring performance on three perceptual tasks to make inferences concerning the degree of perceptual openness of the individual before and after perceptual training.

Optokinetic training was intended to provide an intense perceptual experience; teach, encourage or induce increased eye movement or visual scanning; and provide a "threat-free" experience in open perception. The open perceptual mode is characterized by the child-like, passive view of the world. Therefore, optokinetic training attempted to teach the open perceptual mode by providing a perceptual experience which required this mode.

The search for ways of expanding and enriching the perceptual field is important in human functioning. Intelligence itself seems to be a function of this expanded awareness. Intelligence is defined by Combs as "the ability to behave more effectively and efficiently" (1962, p. 57). If this reasoning is correct, then techniques for inducing increased richness of the perceptual field are important, and this study is an attempt to discover whether optokinetic training is a fruitful approach to the question.

Conversely, deprivation tends to reduce openness of the perceptual field. Research in areas of sensory deprivation give evidence of the absolute necessity of an adequate level of sensory stimulation for development, organization, and maintenance of healthy perceptual processes, and in extreme cases even survival. Occurrences such as marasmus sometimes found in orphanages due to deprivation of human contact, etc., the degenerated states of some institutionalized persons, victims of POW camps, individuals living in isolation, inner (oceanography) and outer space experiences as well as controlled laboratory experiments support the thesis that adequate environmental stimulation and perceptual experiences are an absolute, life-or-death matter. As Christopher Burney, survivor of eighteen months' solitary confinement in World War II, remarked ". . . I soon learned that variety is not the spice, but the very stuff of life" (1957 cited in Ruff, 1966).

And finally, "the capacity for openness to experience and acceptance makes life more pleasant and exciting for adequate persons. It permits them to feel a greater wonder and appreciation of events" (Combs, 1962, p. 58).

Since openness of the perceptual field is a function of previous perceptual experiences, the present study was seeking to discover some of the effects of the optokinetic training experience on openness of the perceptual field. To discover this, people were provided with an optokinetic training experience and then determination of its effects

on openness of the perceptual field was sought by measuring performance on three perceptual tasks: (1) a test of perceptual speed; (2) a test of closure flexibility; and (3) a test of perceptual (picture) differentiation.

CHAPTER II

REVIEW OF RELATED RESEARCH

Introduction

The purpose of the present study was to explore some effects of optokinetic training on openness of the perceptual field. A study such as this belongs within the general purview of perceptual learning or training research, and since there are no studies devoted specifically to this particular approach to perceptual training, i.e., optokinetic training, evidence was selected to indicate its relationship to other studies in this area. This chapter is a review of recent research devoted to the exploration of perceptual learning, perceptual styles, and other aspects of the perceptual process relevant to the dimensions of the present study.

Research Related to Perceptual Learning

Since perceptual openness and acceptance are not innate characteristics, but are learned (Combs, 1962, p. 58), how does perceptual learning take place? Perceptual learning has been variously defined as "the broad range of modifications of perception which have been attributed to learning . . . applied mainly to cases where perception under-

goes a progressive sequence of change culminating in stability or to instances of discrete stable change" (Epstein, 1967, pp. 1-2).

Hebb described perceptual learning as "the modification of perception resulting from prior perceptions" (1966, p. 336). He defined it as the "lasting change in the perception of an object or event resulting from earlier perception of the same thing or related things" (Hebb, 1966, p. 112). Gibson defined it as "any relatively permanent and consistent change in the perception of a stimulus array, following practice or experience with this array. . . ." (1963, p. 29).

From the perceptual frame of reference, Combs and Snygg (1959, p. 190) state that learning is a product of the individual's perceptual field and a "direct outgrowth of the process of differentiation. . . . All learning of whatever variety has as its basic characteristic a progressive differentiation from a more general perceptual field" (1959, p. 190). Therefore, perceptual learning as a form of learning also is a function of progressive differentiation within the perceptual field.

Drever (1960) has classified theories of perceptual learning into four types: judgmental, stimulation, association, and adaptation theories. With such broad and varied definitions and theories of perceptual learning it is not surprising that there are numerous experimental approaches which stem from different theoretical frameworks.

Current research in perceptual learning has been classified by Epstein (1967) into five basic categories. These categories include experiments designed to explore (1) the effects of long-established, extraexperimental past experience; (2) the effects of controlled past experience, experimental training or practice; (3) studies of adaptation to optically produced transformations of the entire stimulus array; (4) investigations of perceptual conflict; and (5) developmental studies.

The present study falls under the category of "effects of controlled past experience, experimental training or practice" and particularly within the group of studies designated as "enrichment" studies. The "enrichment" technique aims at providing enrichment of the exposure history of a subject in hopes that there will be a positive transfer of effects on subsequent tests of discrimination. Typical of this type of approach is the study which uses an "experimental (enrichment) group which receives extended and continuous, non-differentially reinforced exposures to the to-be-discriminated forms . . ." (Epstein, 1967, p. 3). The object is to determine whether or not the prior exposure to the visual form facilitates visual discrimination learning. "The 'enrichment' studies seem to be in general agreement in showing that unreinforced prior exposure can facilitate subsequent discrimination" (Epstein, 1967, p. 296). The present study is similar to the "enrichment" approach in that it provides a perceptual experience, but

differs in that the perceptual experience is only minimally related to the pre- and posttest perceptual tasks.

Some of the transfer of learning studies fall under the category of the environmental enrichment approach such as the area of sensory preconditioning, stimulus predifferentiation and familiarity research wherein the "original task does not consist of a well defined learning situation but, rather of one in which the subject is presented some type of stimulus which is then utilized in the subsequent transfer task" (Hall, 1966, p. 522).

Berlyne (1960) and an increasing number of other psychologists have been looking at the effects of the external and internal stimulation experience on arousal of the Reticular Activating System which serves to regulate the organism's level of activation and, consequently, his general level of functioning at that point in time. In looking at the function of varied experience Fiske and Maddi outline the following propositions which are relevant to the present study:

1. The impact of a stimulus is its momentary contribution to the activation level of an organism (variation, intensity, and meaningfulness of the stimulus determine its impact).

2. An organism's level of activation varies directly over time with the total impact of current stimulation.

3. The impact of a stimulus is derived not only from the intensity and meaningfulness of the stimulus but also from the extent to which it provides variation from prior stimulation.

4. For any task, there is a level of activation which is necessary for maximally effective performance.

5. The behavior of an organism tends to modify its activation level toward the optimal zone for the task at hand.

6. For each stage in an organism's sleep-wakefulness cycle, there is a characteristic or normal level of activation.

7. In the absence of specific tasks, the behavior of an organism is directed toward the maintenance of activation at the characteristic or normal level.

8. Negative affect is ordinarily experienced when activation level differs markedly from normal level; positive affect is associated with shifts of activation toward normal level (1961, p. 18-49).

Epstein in his examination of perceptual learning has evaluated five main propositions which have received considerable experimental support:

1. Assumptions that are learned through everyday experience are important determinanets of perception.

2. Practice, in the form of prior exposure, controlled rehearsal, or differential reinforcement of selective perceiving, can modify perception.

3. Extended exposure to conditions of conflict leads to a gradual modification of perception.

4. When visual stimulation is transformed or distorted, the perceiver adapts to distortion.

5. A variety of perceptual functions exhibit developmental changes (1967, p. 290).

Wohlwill (1966) found two main trends in research on perceptual learning: (1) work on the individual's adaptation to special perceptual conditions, and (2) increasing

efforts aimed at specifying the nature of the mechanisms mediating perceptual learning phenomena. Topics such as sensorimotor adaptation (short-term adaptation effects); observing and scanning responses and attentional processes (eye movements, tactual exploration, visual search, etc.); mediation of practice effects in perceptual tasks; perceptual mediation of discrimination learning; the stimulus predifferentiation problem and role of reinforcement, associative processes, and response factors (familiarity and related factors); and the effects of experience (animal research and research with children and adults) are currently receiving attention from perceptual psychologists of various frames of reference.

Evidence of research in perceptual learning being conducted in various locations throughout the world is found in Psychological Abstracts. Unfortunately, there is limited access to some of these studies. Gibson (1963) reports that the role of exploratory movements of both the hand and eye are being studied by Russian psychologists. "There are, they proposed, two types, (a) searching and directing, and (b) pursuit or 'gnostic'" (Gibson, 1963, p. 48) movements.

Research on reading skill embodies findings relevant to perceptual learning within a larger context along with other aspects which are distinct from perceptual learning. "One aspect of reading is the acquiring of the directional scanning habit. . . . It is generally agreed that habits acquired through reading experience develop a kind of per-

ceptual primacy phenomenon" (Gibson, 1963, p. 49). Neisser in his studies of visual search found that people show considerable improvement in efficiency of performance with an extended series of practice sessions. He also found that a subject could learn to handle a multiple search task as quickly as a single search task. For a complex task like scanning newsclippings, optimal efficiency requires an extended period of practice (Neisser, 1964).

To formulate theories of perceptual learning, "the individual's orienting reaction to a stimulus source, to focusing and scanning mechanisms, and to attentional constructs designed to handle changes in discrimination based on selection from a complex stimulus input" (Wohlwill, 1966, p. 208) are receiving increasing emphasis by psychologists.

Research Related to Perceptual Style

> A number of psychological tests and variables that are cognitive in nature although they do not deal directly with intelligence have attracted considerable attention in recent years. Many of these other aspects of mental functioning can be reliably measured and have been grouped together loosely as measures of cognitive or perceptual style. . . . (Holtzman, 1966, p. 8).

There are three main streams of experimental work in the area of perceptual style which began from different frames of reference and seem to be moving closer together. Herman Witkin and his colleagues (1954) explored the concept of field dependence which they later broadened into the general concept of psychological differentiation. They

found that people differ consistently in judgmental ability when faced with the conflicting cues of the figure-ground relationship present in their perceptual field.

The second stream of research on perceptual style, cognitive control principles, includes the work of Riley Gardner and others at the Menninger Foundation (1960, 1962). They have been investigating perceptual style for the past 10 years and have identified six fairly independent dimensions which have been treated factor analytically. Although they began with a psychoanalytic theory of ego functioning approach to cognitive organization, they gradually blended these ideas with Gestalt psychology and Piaget's work on cognitive development in the child, and finally formulated a set of cognitive control principles which characterize an individual's style of coping with his environment. Their six dimensions or cognitive control principles include: (1) field articulation (similar to Witkin's field dependence); (2) leveling-sharpening; (3) equivalence range which became called conceptual differentiation; (4) extensiveness of scanning (the amount of shifting of attention when trying to size up a stimulus); (5) tolerance for unrealistic experiences; and (6) constricted-flexible control.

The third stream of research in the area of perceptual style, conceptual styles, concerns the work of Jerome Kagan and his associates (1963) and has a more cognitive emphasis than the other two streams which are more perceptual in

focus, but, nevertheless, there are similar concepts and overlapping of research findings. Kagan's three conceptual styles include: analytic-descriptive, rational, and inferential-categorical.

"Different cognitive styles can be thought of as stable individual differences in mode of perceptual organization and conceptual categorization of the external environment . . ." (Holtzman, 1966, p. 8). Some rather ingenious tests and experiments have been devised to demonstrate these various perceptual styles such as the two standardized tests used in the present study, the Closure Flexibility test and the Perceptual Speed test.

Scanning

Solley and Murphy (1960) felt that the heart of the perceptual act was the process of scanning. This process of scanning "involves the 'aiming' of sense organs, or indeed, of the whole body in such a manner as to present sensitive surfaces to stimulus energies" (1960, p. 252). The individual scans maximally for exteroceptive cues, but also for internal cues as well as memoric cues.

People differ in the degree to which they scan their environment for information which then becomes a part of their perceptual field. Scanning which "represents the degree of attention deployment to objects, object properties, and events . . ." (Gardner, et al., 1959, p. 82) is highly related to the quality of openness of the individual's

perceptual field. Openness of the perceptual field refers to the individual's ability to admit evidence into awareness (Combs, 1962, p. 56) and, therefore, the extent to which the individual scans and is aware of his environment helps determine his openness to experience. Later Gardner and his colleagues changed the title of this control principle from scanning to "focusing" and determined that "the focuser is broadly aware of many aspects of the stimulus field because he is constantly scanning the field, whereas the nonfocuser is more narrow in his deployment of attention. . . ." (Gardner et al., 1959, p. 46). The use of the words "scanning" and "focusing" to describe essentially the same phenomenon has added an element of confusion to the literature.

Benfari (1966) found that cognitive controls serve as regulators of affect states. He found that high scanning subjects made fewer errors in judgment than limited scanners who tended to increase their error scores. The scanner is broadly aware of many aspects of the stimulus field due to his attending or scanning whereas the limited scanner has a more narrow deployment of attention. Similarly, Piaget found in his theory of centration and decentration that "one of the most pronounced characteristics of preoperational thought is its tendency to <u>center</u> . . . attention on a single, striking feature of an object of its reasoning to the neglect of other important aspects, and by so doing, to distort the reasoning" (Flavell, 1963, p. 157).

Research Related to the Dimensions of the Present Study Orienting Response

Similar to the scanning process in that it involves eye movements, but dissimilar in that it involves the reflex, involuntary eye movement in response to a novel stimulus is the orienting response which has been extensively investigated by Russian psychologists and by an increasing number of American physiological psychologists. Berelyne (1960) lists the following physiological correlates and components of the "what is it?" response to a novel stimulus which illustrates the complex physiology of perceptual processes:

1. Changes in Sense Organs
   a. The pupil of the eye dilates.
   b. Photochemical changes, lowering the absolute threshold for intensity of light, occur in the retina.

2. Changes in the Skeletal Muscles that Direct Sense Organs
   a. The eyes open wide and turn toward a source of visual stimulation; this action is often accompanied by movements of the head, the trunk, and even the whole body.
   b. The head turns toward a source of sound.
   c. Animals prick up their ears.
   d. Sniffing occurs, especially in animals that use their olfactory sense much more than man.

3. Changes in General Skeletal Musculature
   a. Ongoing actions are temporarily arrested.
   b. General muscle tonus rises, increasing readiness for activity in the skeletal muscles. . . .
   c. There may be diffuse bodily movements and vocalization. . . .
   d. There is an increase in muscular electrical activity, detectable with the electromyograph.

4. Changes in the Central Nervous System
   a. Alpha waves, when present, disappear and give place to faster, more irregular EEG activity.
   b. When slower EEG waves, representative of drowsy somnolent states, are present, they are replaced by alpha waves.
   c. If, however, fast waves in the beta (14 to 30 cps) or gamma (over 30 cps) range are already present, the orientation reaction will not produce an EEG change.

5. Vegetative Changes
   a. The blood vessels in the limbs contract, while those in the head expand.
   b. The GSR (an increase in the electrical conductance of the palm and sole) occurs.
   c. There are cardiac and respiratory changes, whose exact nature varies . . . (p. 81-82).

Activation of the reticular activating system and its behavioral correlates accompanying the orienting response indicate a heightening of alertness, awareness, and attention as well as an increased sensitivity of all sensory modes. Consequently, "when the subject is maximally orienting, information is received at a maximum level . . ." (Mulholland, 1968, p. 34).

Eye Movements

Eye movements may be classified roughly as voluntary as in some forms of visual scanning or involuntary as in the eye movements related to the orienting reflex. They also may be characterized as horizontal, vertical, oblique, convergent, and sometimes divergent. Even "during fixation on an object, the human eye is constantly in movement, making small but rapid rotations" (Yarbus, 1967, p. 95).

These small, rapid eye movements or saccades seem to be essential in visual acuity and contour perception. Pursuit eye movements cannot be put into action voluntarily unless there is an object moving in the field of vision. Consequently, eyes always move with saccadic movements (short jumps) when looking from one target to another, but move smoothly when following a moving target and closely relate in speed to that of the moving target (Adler, 1965). "Satisfactory conditions of perception are possible when the speed of the object does not exceed 100-200 deg/sec" (Yarbus, 1967, p. 170).

> The close relationship between the eye and the mind so frequently symbolized in ancient drawings has become very evident to the modern neurophysiologist. . . . The experienced electroencephalographer has learned to regard carefully the influence of the eyes on brain function as represented by electrical activity (Bickford and Klass, 1964, p. 293).

An example of the influence of eye movement on brain activity is found in a particular type of occipital-parietal electrical activity related to eye movement which has been referred to as the lambda wave. "Prominent waves of this type occur in about 10 per cent of the normal population. While the exact nature of the phenomenon is not yet clear, it appears to be a cerebral potential evoked by a retinal stimulus of adequate complexity. . ." (Bickford and Klass, 1964, p. 293-294). Lambda waves are found present when: (1) a picture of adequate complexity is viewed; (2) illumination is well above the visual threshold; (3) the picture is in clear focus; and (4) the picture is inspected by a

series of saccadic movements. There seems to be some relationship between the presence of lambda waves and interest and attention. Lambda waves do not occur unless the eye movements scan across a visual design of some sort and "no lambda activity occurs during visual fixation" (Bickford and Klass, 1964, p. 294).

"If eye movements . . . seem to mediate perceptual learning, and developmental changes in perception, these responses are . . . themselves modified through learning and experience. . . ." (Wohlwill, 1966, p. 209). Schaffer and Gould (1964) found evidence that subjects previously receiving extended tachistoscopic training showed a different pattern of eye movements on a visual search task as compared with subjects with no prior experience. The practice group searched more rapidly due to fewer fixations in the search task.

Optokinetic Nystagmus

The present study was designed to make use of a phenomenon characteristic of vision, optokinetic nystagmus. Optokinetic nystagmus is an involuntary, rhythmic oscillation of the eyes. Because motion of the head or motion of the surroundings results in loss of the visual object, a a compensatory gaze deviation occurs, allowing the retinal image to remain as long as possible. "This is achieved by vestibular as well as by optokinetic oculo-motor reflexes, and it therefore seemed logical to postulate that both re-

flexes may have a common central mechanism" (Monnier, 1967, p. 205). Bender and Shanzer (1964) remarked that "it is not generally appreciated that the reticular activation system and the oculomotor pathway are located in the same zone of the brain stem tegmentum" (cited in Mulholland, 1968, p. 28).

Optokinetic nystagmus was first noted by Purkinje in 1825 while watching a crowd at a cavalry parade in Vienna (Smith, 1963), and it seems likely that it was noticed much earlier due its common occurrence. It is characterized by a slow pursuit movement in the direction of the moving object which is interrupted by a quick return movement of the eye in the opposite direction (Monnier, 1967, p. 207).

Rademaker and Ter Braak (1948) have distinguished two levels of optokinetic nystagmus. The first level is a subcortical optokinetic nystagmus which occurs when all parts of the environment move in the same direction and the second, a cortical optokinetic nystagmus in response to the movement of a small object through the visual field inducing a "grasp reaction" (cited in Monnier, 1967, p. 207-208). The latter, higher reaction is superimposed on the subcortical mechanism, has greater importance in higher mammals, and is characteristic of the optokinetic training process investigated by the present study.

> The mechanism of nystagmus, which contributes to some extent to movement perception, is coordinated in the reticular formation of the brain stem from convergence of retinal, vestibular, and cor-

> tical impulses. Thus the visual perception of movement is the result of a complex regulation of retinal, vestibular, and proprioceptive messages with attentiveness and is primarily coordinated in the brain stem and elaborated in the cortex (Jung, 1961, p. 661).

Because the eye has a tendency to follow or track objects which move in the visual field, the present study made use of this natural phenomenon to see whether it could serve as a vehicle for increasing perceptual openness. In other words, the present study was an attempt to utilize this natural phenomenon of nystagmus to increase openness.

Precisely what occurs that produces the nystagmatic effect is not yet fully understood. During the course of the optokinetic training experience the following variables: (1) pattern perception which has the stimulus properties of contours, edges, and interfaces between the black and white figure-ground borders; (2) the flicker, stroboscopic effect of the light and shadows reflected from the moving surface of the optokinetic drum; and (3) a balanced relationship between change and repetition in the moving perceptual field were also involved, but the precise relationship of any to the whole process is not clear. Therefore, the optokinetic training experience is treated in a holistic, experiential manner by the present study. Since the optokinetic training device becomes in large part the perceptual field at that point in time for the attentive individual, the characteristics of the perceptual field such as stability, fluidity, intensity, and direction (Combs and Snygg, 1959)

come into play.

After-effect of Apparent Movement

Following optokinetic training, the subject, when questioned, frequently reported the sensation of seeing stationary objects in his perceptual field move. This is called the after-effect of apparent movement (Holland, 1965), and it lasts for a relatively short time depending on a number of factors related to the individual and the situation. Other examples of this same illusion can be found in natural settings such as watching a waterfall, the surface of a road while driving, the wake of a boat, a swiftly moving stream, and other similar situations, and then looking quickly away at stationary objects which then frequently can be seen to "stream" in a similar fashion, but in the opposite direction (Holland, 1965).

Since very little, if any, research has been done with optokinetic training illustrated by the present study except perhaps on a minimal level with lower animals (Jung, 1961), the closest variant of the phenomenon is the extensive research which has been done on the spiral after-effect (Holland, 1965).

The spiral after-effect phenomenon is similar to the optokinetic training experience in that they both are characterized by movement, pattern, direction, novel stimulation, etc., but they differ in that the spiral is viewed for an extremely short time due to the fact that with massed prac-

tice the after-effect of a particular spiral design has a tendency to diminish in effect. Consequently, the typical spiral exposure time is 10 seconds or so. With in increase in the complexity of the original stimulus pattern, i.e., visual array or design on the optokinetic drum, the subject can watch for an extended period of time which could allow for the cumulative effect of repeated stimulation in a particular sensory mode without habituation or lessening of effect due to familiarity.

The visual illusion following the movement perception has characteristics (velocity, persistence, vividness, etc.) similar to the original movement, and these characteristics change in relation to the color, complexity, uniformity, speed and brightness of the surface of the original real movement (Holland, 1965).

Summary and Implications for the Present Study

There are a number of attempts being made using a variety of approaches from different research orientations and theoretical frames of reference to extend understanding of the process of perceptual learning and the development of perceptual organization. Individuals vary in their perceptual styles and modes of organizing and constructing their perceptual fields. These perceptual styles can be modified somewhat through new perceptual experiences and perceptual training. Although there are a number of studies being done regarding the process of perceiving and evaluating

the degree of perceptual awareness of the individual at that point in time, very few have attempted a controlled study of the development of perceptual openness or awareness through perceptual training due to the complexity of the task.

The visual phenomenon, optokinetic nystagmus, seemed to have possibilities for opening and speeding up perceptual awareness. Therefore, the present study sought to take advantage of this natural phenomenon and determine whether, through providing an optokinetic training experience, perceptual openness could be increased.

CHAPTER III

EXPERIMENTAL DESIGN OF THE STUDY

Theoretical Framework

The fundamental postulates of perceptual psychology state that all behavior is lawful and that all behavior is determined by the perceptual field of the individual at the moment of action. The perceptual field consists of "the entire universe, including himself, as it is experienced by the individual at the instant of action" (Combs and Snygg, 1959, p. 20). If behavior is a function of perception, then changing behavior which is the chief concern of education requires some change in the individual's perceptual field.

The characteristics of the perceptual field include the following four properties: stability, fluidity, intensity, and direction. The perceptual field has a figure-ground composition and the "emergence of figure from ground" or differentiation is the process of change in our perception of events. Therefore, "the intensity with which events are experienced in the phenomenal field will be a function of differentiation and levels of awareness . . ." (Combs and Snygg, 1959, p. 27).

> Each of us is constantly searching his field for details and meanings which will better enable him to satisfy need. This process

> involves a continual change in the perceptual field by the constant rise of new characters into figure and consequent lapse of other characters into ground. . . . This process, from the point of view of the behaver, is one of increased awareness of details and is, therefore, called differentiation. It is through differentiation that change in the perceptual field and, hence, change in behavior occurs" (Combs and Snygg, 1959, p. 28-29).

Perceptions differentiated in terms of the nearness of the events experienced, similarity, intensity, common fate, novelty or contrast, and common movement or direction serve to organize the perceptual field.

Combs and Snygg (1959, p. 210) list seven variables which affect perception. These variables include: (1) the physical organism, (2) time, (3) opportunity, (4) the effect of need, (5) goals and values, (6) the phenomenal self, and (7) the restriction of the field. Because it has been postulated that "all behavior, without exception is determined by the perceptual field at the moment of action" and "to produce change in behavior, then, it will be necessary to produce some change in the individual's perceptual field," it follows that alteration of the seven variables which affect perception should result in changes in the perceptual field and, consequently, change in behavior to some extent.

> Since perceptions are the product of experience, there is no more fruitful way of affecting or changing perception than through the medium of some kind of new experience. It is rare that we are successful in changing perceptions either in ourselves or others simply

> by the process of telling. Perceptions do not change simply by "willing," unless this process is accompanied by some kind of experience as well. Although individuals can seldom change their perceptions directly, it is possible for us to make changes in the ways in which we perceive through the kinds of experiences we seek" (Combs and Snygg, 1959, p. 355).

Definition of Terms

Optokinetic reactions.--A term referring to the movements of the eye or eyes in response to a moving visual stimulus.

Optokinetic training.--Perceptual training based on optokinetic responses to a moving visual stimulus over time.

Perceptual field.--A term referring to "the entire universe, including himself, as experienced by the individual at the instant of action. . . ." (Combs and Snygg, 1959, p. 20).

Openness of the perceptual field.--Refers to the degree to which the perceptual field is capable of change and adjustment in such fashion as to make fullest possible use of experience and ability to accept into awareness any and all aspects of reality.

Closure flexibility.--Indicates the ability of the individual to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions.

Perceptual speed.--Indicates the individual's speed in finding figures, making comparisons, and carrying out other very simple tasks involving visual perception.

Differentiation.--The process of continual change in the perceptual field as new characters rise from ground into figure; the increased awareness of details.

Picture differentiation.--Represents the individual's ability to visually scan a picture for details.

Statement of Hypothesis

The theoretical position on which the present study is based states that openness of the perceptual field is a function of previous perceptual experiences. The main purpose of the present study was to investigate some of the effects of the optokinetic training experience on openness of the perceptual field as measured by performance on three perceptual tasks: perceptual speed, closure flexibility, and perceptual (picture) differentiation. Therefore, the following three specific predictions were stated:

Prediction One.--Optokinetic training will improve performance on the perceptual speed task.

Prediction Two.--Optokinetic training will improve performance on the closure flexibility task.

Prediction Three--Optokinetic training will improve performance on the perceptual (picture) differentiation task.

Optokinetic Training

The experimental treatment experience, optokinetic training, was an approach to perceptual learning or train-

ing based on the natural optokinetic responses to a moving visual stimulus over time. The present study used the Optokinetic Perceptual Learning Device (Patent Applied For) as a vehicle for perceptual training in an effort to enhance perceptual processes, and openness of the perceptual field by providing a unique perceptual experience.

Description.--The optokinetic perceptual learning device was a light, plastic cylinder or drum mounted on the turntable of a portable phonograph. The dimensions of the drum were 6 in. high and 8 in. in diameter; drum and phonograph had a combined height of 10 in.

The outer surface of the drum was covered with an octagonal-shaped, paper band composed of eight Merriam-Webster Pocket Dictionary pages. The pages were xeroxed to provide a sharp black and white contrast which served as the stimulus pattern. The stimulus pattern was illuminated by a high-intensity lamp placed at the right side of the subject. As the drum moved with the revolution of the turntable, the design band became a moving surface, and, therefore, a rapid presentation of a complex visual stimulus.

It was expected that the effect of repeated stimulation (pattern, movement, light changes, etc.) occurring over a sustained (five minutes) would summate, and serve to activate the individual through the orienting response, increase sensory sensitivity, and, therefore, openness of the perceptual field.

Administration.--The subject was seated comfortably

Figure 1. Optokinetic Perceptual Learning Device and subject.

about 20 inches away from the drum and phonograph. A brief explanation of the device served as an orientation to the experience. An exact typescript of the directions for viewing is included in Appendices A and C. Length of stimulation for each subject receiving the experimental treatment experience included a one-minute warm-up period at 16 r.p.m. and five minutes of 33 1/3 r.p.m. actual training time. A minute was allowed following the viewing period to allow for the subject's perception of the after-effect of apparent movement. At 33 1/3 r.p.m. perception of the after-effect of apparent movement is not as noticeable as it is at a slower speed such as 16 r.p.m., and, therefore, no formal record was kept of the presence or absence of this illusion since it was not the primary focus of the present study.

The Perceptual Speed Task

Description.--The first prediction stated that optokinetic training would improve performance on the perceptual speed task. This task refers to the "speed in finding figures, making comparisons, and carrying out other very simple tasks involving visual perception" (French et al., 1963, p. 31) and "the ability to rapidly compare visual configurations and identify two figures as similar or identical, or to identify some particular detail that is buried in distracting material" (Perceptual Speed Test Manual, 1966, p. 1). The test was developed by L. L. Thurstone and

T. E. Jeffrey, and published by the Industrial Relations Center, the University of Chicago.

Perceptual speed is considered to embody the following sub-factors:

> (a) speed of symbol discrimination, (b) speed of making comparisons . . . (c) speed of form discrimination as in recognizing predetermined but novel configurations, (d) speed of classification of readily discriminable configurations into categories, and possibly others" (French et al., 1963, p. 31).

The Perceptual Speed Test was chosen as an indication of the subject's ability to allow data into awareness without distortion, i.e., easily and quickly, and, therefore, an indication of the degree of perceptual openness.

> The test booklet contains one page of instructions and practice exercises, and seven pages of test items. There are 140 items in the test. Each item presents a figure at the left which is repeated at the right as one of five similar figures. The subject marks the number of the figure at the right which is identical with the figure at the left. The test is timed, and is a measure of the speed with which the subject can perceive identities in sets of similar-appearing figures. The Perceptual Speed Test is a paper-and-pencil test and can be administered individually or to groups . . . (Perceptual Speed Test Manual, 1966, p. 1).

Administration.--Directions were tape recorded to insure standardization of procedures and exact typescripts of the procedures for each group are found in the Appendices A, B, C, and D. The procedure for administration of the Perceptual Speed Test was as follows:

> 1. Distribute the Perceptual Speed test booklets. Ask the subjects to write their name, age, sex, date, occupation [major], and any additional information that is desired.

2. [Have subjects] read . . . the directions on the first page. Ask the subjects to answer the three practice exercises. Caution them not to open the test booklets after completing the practice exercises.
3. Check to see that the subjects have correctly answered the practice exercises. The correct answers are: 4, 2, 5, respectively. If any of the subjects do not have the correct answers, make sure that they understand the instructions before starting the timed part of the test. Answer any questions.
4. When the subjects are ready, [have them read] say: "When the signal is given, turn the page and mark more problems of the same kind. Work rapidly and accurately, but do not guess. Wrong answers will count against you. You are not expected to finish all of the test in the time allowed. You will have exactly five minutes. Begin." Do not answer any further questions.
5. When exactly five minutes have elapsed say: "Stop working, please." Collect the test booklets immediately (Perceptual Speed Test Manual, 1966, p. 2).

Directions for the test are found in Appendix E along with sample items from the test. Groups A and B followed the same procedures twice during pretest and posttest administrations; groups C and D, once.

Time limits were followed exactly using a stop watch. Several minutes were allowed for the communication and understanding of directions, and the test was timed for five minutes.

Scoring.--The score (S) equals the number of right answers (R) minus one-fourth of the number of wrong answers (W/4). W/4 represents the usual correction for guessing when there are five alternative answers. Omitted answers are ignored in scoring the test" (Perceptual Speed Test Manual, 1966, p. 3). Scoring was done by two persons to

to insure accuracy.

The Closure Flexibility Task

Description.--The second prediction stated that optokinetic training would improve performance on the closure flexibility task. This task represented "the ability to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions" (French et al., 1963, p. 9). Flexibility of closure has been compared to Witkin's (1962) field-independence concept.

The Closure Flexibility Test (Concealed Figures) is similar to Witkin's Embedded Figures Test (Witkin, 1950), and the original Gottschaldt Figures Test (Gottschaldt, 1926, cited in Vernon, 1966) from which it was adapted. The test was developed by L. L. Thurstone and T. E. Jeffrey and is published by the Industrial Relations Center, The University of Chicago. It measures what Thurstone (1944) identified as the "second closure factor" which concerns the individual's ability to hold a configuration in mind despite distraction. "It is the capacity to see a given configuration (diagram, drawing, or figure) which is 'hidden' or embedded in a larger, more complex drawing, diagram, or figure" (Closure Flexibility Test Manual, 1965, p. 1).

The closure flexibility task was selected for use in the present study because it was one of the best objective measures of the degree to which the individual's perceptual

field was capable of change and adjustment, and, hence, an aid to inference regarding perceptual openness.

> Closure Flexibility is a paper-and-pencil test which can be administered individually or to groups. The test booklet contains one page of directions (including one sample item and one practice exercise) and seven pages of test items (49 items). Each item consists of a figure, presented on the left of the page, followed by a row of four, more complex, drawings on the right. Some of these four, more complex, drawings contain the given figure in its original size and orientation. Instructions are to look for the original figure in each of the complex, drawings and to put a check under each drawing which contains it and a zero under each which does not" (Closure Flexibility Test Manual, 1965, p. 1).

Administration.--Directions were tape recorded to insure standardization of procedures and exact typescripts of procedures for each group are found in the Appendix A, B, C, and D. The following procedure for administration of the Closure Flexibility test was followed:

1. Pass out the Closure Flexibility test booklets, and ask subjects to fill in their name, age, sex, occupation [major], the date, and any additional information that is desired. Caution them not to open the test booklets until told to do so.
2. Read . . . the "Directions" section on the cover. Then ask the subjects to fill in the practice sample. If any of the subjects do not get the correct answers, make sure that they understand what it is they are to do before they start the timed part of the test. Answer any questions that are asked.
3. When you have finished discussing the practice exercise, read the last paragraph on the cover, and then say: "Begin." Do not answer any further questions.
4. When exactly ten minutes have elapsed, say: "Stop working, please." Collect the test booklets immediately (Closure Flexibility Test Manual, 1965, p. 2).

Directions for the test are found in the Appendices along with sample items from the test. Groups A and B received two administrations of the Closure Flexibility test while groups C and D received only one. Time limits were followed exactly using a stop watch. Several minutes were allowed for the communication and understanding of directions and the test was timed for ten minutes.

Scoring.--"The raw score is the number of correct answers minus the number of wrong answers. This scoring formula is written S = R - W and represents the usual correction for guessing" (Closure Flexibility Test Manual, 1965, p. 3). All tests were scored by two persons to insure accuracy.

The Perceptual (Picture) Differentiation Task

The third prediction stated that optokinetic training would improve performance on the perceptual (picture) differentiation task. This task was chosen as a measure of the subject's response fluency to a less structured target array than the previous perceptual tasks discussed in the present study. It was designed to yield some evidence for the relative degree of perceptual openness indicated by the individual's ability to differentiate, i.e., his awareness of details. Again speed and decisiveness were factors influencing the subject's facility for allowing information into awareness. This task was designed by the Investigator.

Description.--This task consisted of using George Seurat's Sunday Afternoon on the Island of La Grande Jatte (Appendix G) as a target picture for a verbal description of the content by the subject. It was chosen as the target picture because of its classical precision, use of horizontals and verticals, dark and light, form and distance, and line and volume (Kuh, 1965). Figure and ground in this picture are composed of small dots of color, and at times it is difficult to differentiate objects within the picture. A xerox copy of the picture was used in the present study to eliminate the color variable. The subject was asked to write what he saw in the picture. Special emphasis was placed on the word, saw, as distinguished from what he might already know about the picture.

Administration.--Administration of the picture differentiation task occurred before and after the experimental treatment experience and between the administration of the other two tests for groups A and B. Groups C and D received it for one administration of the test series. The verbal fluency of the subject's response before and after experimental treatment was compared as an indication of the influence of the treatment experience on performance.

The task consisted of one target picture described above. The target picture was shown to the subject and he was asked to write his name at the top of the picture. He was told the name of the painter because earlier administrations of this task showed that subjects tended to try

to remember the painter's name as a part of their response rather than directly responding to the visual content. The instructions were to write in the spaces provided what the subject saw in the picture. The subject was allowed two minutes in which to record his response and at the end of the two minutes he was told to stop and his response sheet collected immediately.

Scoring.--The raw score for this task consisted of a simple word count to indicate fluency of the response. Each of the four groups of subjects contained individuals who chose the more economical listing form of response and others who seemed to prefer a textual response. These two modes of response, list and text, were treated separately in the statistical treatment of the data.

Design of the Research

Data were collected on three perceptual tasks performed under four group situations. The three perceptual tasks were used as pretest and posttest measures for two groups and posttest measures only for two groups. The performances on the perceptual tasks were used to measure the degree of perceptual openness before and after the experimental treatment experience. The three tasks included measures of closure flexibility, perceptual speed, and perceptual (picture) differentiation. The nature of these tasks and the scoring procedures used were described in a separate section.

Volunteer subjects were assigned to experimental treatment groups, using a table of random numbers. Procedures were standardized for each of the four experimental treatment groups. The experimental instructions for each subject depended on the group to which he was assigned. Each subject performed each of the three perceptual tasks at least once. Complete experimental instructions for each group are shown in the Appendix A, B, C, and D. The details of these Appendices are made clear in the sections of this chapter devoted to the description of the tasks and the experimental procedures used.

The Sample

The sample was composed of 40 volunteer subjects from the 1968 summer enrollment at the University of Florida. Subjects were recruited from psychology, education and architecture courses. The Investigator visited each class with the permission of the instructor. The instructor introduced the Investigator and the class was told that the present study was research for a doctoral dissertation concerning visual perception. The Investigator explained that the subjects would not be personally evaluated, that the results would be confidential, and that they would be paid. The amount of time it would require, and the location of the testing facilities were also stated. A sign-up sheet was then passed around the class to allow volunteers to select their appointment time.

The sample included students from 16 different academic majors, a male-female ratio of 23 males to 17 females, and an age range of 19 to 53 with a mean age of 28; median, 21; and mode, 19. Further information concerning the nature of the sample is shown in Appendix H.

Each student was paid a dollar for his services and cautioned not to discuss the experiment with anyone until it was completed.

Experimental Procedures

Subjects were assigned by use of a table of random numbers (Blommers and Lindquist, 1960, p. 512) to four 10-person experimental treatment groups following the Solomon Four-Group Design (Solomon, 1949, cited in Campbell, 1963). The four treatment groups included: (1) pretest-posttest administration of the closure flexibility, perceptual speed, and perceptual (picture) differentiation tasks with optokinetic training preceding the second administration of the tasks; (2) pretest-posttest administration of perceptual tasks with no optokinetic training; (3) optokinetic training with posttest only; and (4) posttest only. This design enabled determination of the effect of testing, and interaction of testing and the treatment experience.

The experimental testing sessions in which subjects were tested on the perceptual speed, closure flexibility, and perceptual (picture) differentiation tasks were held

TABLE I

EXPERIMENTAL TREATMENT GROUPS AND PROCEDURES

Group	PS	PD	CF	OT	PS	PD	CF
A	X	X	X	X	X	X	X
B	X	X	X		X	X	X
C				X	X	X	X
D					X	X	X

in the office of the Hayes Apartments. This arrangement provided a maximum of privacy and quiet during testing. The office was air-conditioned, carpeted, and neutral in interior design. Every effort was made to standardize environmental conditions during testing. All subjects were tested in the same setting, and remained seated during the entire testing period. Seating, adequate light, air- conditioning and freedom from distractions were reasonably uniform throughout. Subjects were supplied with pencils, test booklets, and a firm writing surface. Each subject received the set of instructions suitable to his assigned experimental treatment group. The directions for each task are found in Appendices E, F, and G; instructions for each series of tasks are found in Appendices A, B, C, and D.

All experimental tasks were administered during the same test session. Test sessions lasted from 30 to 60 minutes depending on the individual and the experimental treatment group to which the subject was assigned.

Three tasks were chosen to measure variables which seemed to reflect the degree of perceptual openness of the individual. Measures of closure flexibility, perceptual speed, and perceptual (picture) differentiation were used as indices of the openness of the perceptual field.

The closure flexibility task represented the capacity to see a given configuration in a larger design. The perceptual speed task represented the ability to rapidly compare visual configurations. The perceptual (picture) differentiation task indicated the ability to differentiate details in a complex visual array.

Treatment of Data

Based on the theoretical position that "openness of the perceptual field is a function of previous perceptual experiences," the data collected for this study were used to investigate some of the effects of optokinetic training on perceptual openness. The degree of perceptual openness was evaluated by examining differences between the scores of subjects who received the optokinetic training experience and those who did not.

In the second place, data were collected to indicate the effect of pretesting on the experimental treatment experience and on subsequent posttesting.

Analysis of variance was used to determine the effect of pretesting and the comparability of groups scores both pre- and posttest administrations, the Duncan's New Multiple-

Range Test was used to determine which of the differences between means were significant, the Mann-Whitney U test was used to determine the level of significance of the gain scores, and an intercorrelation matrix was constructed to reveal the relationships among the various test variables.

The majority of the computations performed on the data were carried out with the assistance of the IBM 360-50 computer at the University of Florida Computing Center.

CHAPTER IV

STATISTICAL ANALYSIS AND DISCUSSION OF THE RESULTS

Introduction

The purpose of the present study was to examine some of the effects of optokinetic training on openness of the perceptual field. The degree of openness of the perceptual field was measured by performance on three perceptual tasks: perceptual speed, closure flexibility, and picture differentiation. Scores on the tests were used as measures of the degree of perceptual openness of the individual before and after the experimental treatment.

Administration for all four groups was standardized according to the procedures outlined in Appendix A, B, C, and D. Groups A and B received pretest administrations of the three perceptual tasks; Groups C and D did not. Groups A and C received the experimental treatment experience, optokinetic training; Groups B and D did not. Therefore, Group A served as the traditional experimental group with Group B as the control group. Groups C and D were used to reveal the effects of the pretesting experience. The major objective of the study was met by determining the extent to which Groups A and B differed in their ability to perform

on the pre- and posttest administrations of the three perceptual tasks. The main and interaction effects of the pretesting experience were determined with the aid of Groups C and D which received no pretesting.

This chapter is devoted to the analysis of the data gathered in the present study. First, the findings for each task are presented. The statistical treatment of results for each task included an analysis of variance, Duncan's New Multiple-Range Test (Duncan, 1955; Edwards, 1960), and the Mann-Whitney U Test (Siegel, 1956). An analysis of variance was used to test the significance of the difference between means. Following the analysis of variance which concluded that the means differed significantly, the Duncan's New Multiple-Range Test was used "to determine which of the differences between these means are significant and which are not . . ." (Edwards, 1960, p. 137). The Duncan's New Multiple-Range Test is "useful when we are concerned with multiple comparisons among the means" (Edwards, 1960, p. 136).

On the advice of statisticians, the Mann-Whitney U test was used to compute the significance of the difference between two independent samples, the gain scores for Groups A and B, pre-post measures for each task. The Mann-Whitney U Test was used to "determine whether differences in the samples constitute convincing evidence of a difference in the processes applied to them" (Siegel, 1956, p. 95). "This is one of the most powerful of the nonparametric tests, and

it is a most useful alternative to the parametric *t* test when the researcher wishes to avoid the *t* test's assumptions. . . ." (Siegel, 1956, p.116), i.e., "they do not involve the assumption of sampling from a continuous and normally distributed population" (Edwards, 1960, p. 113). The Mann-Whitney U Test was used because the present study compared two independent, small samples, and, in the case of the picture differentiation task, unequal N's.

Second, an intercorrelation matrix was computed using all task variables and indicating the relationship between pre- and posttest administration of the other tasks. Third, the results are discussed in terms of their relevance to the specific predictions of the present study. The three predictions stated that: (1) optokinetic training will improve performance on the perceptual speed task; (2) optokinetic training will improve performance on the closure flexibility task; and (3) optokinetic training will improve performance on the picture differentiation task.

Performance on the Perceptual Speed Task

Pretest and posttest measures were taken on the perceptual speed task for Groups A and B, and only posttest measures for Groups C and D. Groups A and C received the optokinetic training experience prior to the posttest administration of the perceptual speed task.

The means and standard deviation scores for the pretest administration of the perceptual speed task are found in

Table 2, followed by the results of the analysis of variance of those data in Table 3.

TABLE 2

PRETEST PERCEPTUAL SPEED TASK MEANS AND STANDARD DEVIATIONS (GROUPS A AND B)

Group	N	Mean	SD
A	10	65.08	14.61
B	10	66.30	11.31

An analysis of variance was undertaken in order to compare initial scores for Groups A and B.

TABLE 3

PRETEST PERCEPTUAL SPEED TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A AND B)

	Degrees of Freedom	Sum of Squares	Mean Square	F-ratio
Between Groups	1	7.50	7.50	.04
Within Groups	18	3,072.86	170.71	
Total	19	3,080.36		

The F-ratio shown in Table 3 indicates no significant difference between groups. Therefore, Groups A and B were not significantly dissimilar initially.

Table 4 depicts the means and standard deviations for all groups on the posttest administration of the perceptual speed task. This includes Groups A and B with the pretest experience and Groups C and D, without.

TABLE 4

POSTTEST PERCEPTUAL SPEED TASK MEANS AND STANDARD DEVIATIONS (GROUPS A, B, C, D)

Group	N	Mean	SD
A	10	81.82	14.21
B	10	77.92	12.68
C	10	62.72	15.48
D	10	64.85	5.70

Inspection of Table 4 shows Group A having the largest mean score (81.82) on the posttest administration of the perceptual speed task followed by Group B, D, and C in that order. Groups A and C received the optokinetic experience prior to posttesting. The results of the analysis of variance for Groups A, B, C, and D appear in Table 5.

TABLE 5

POSTTEST PERCEPTUAL SPEED TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A, B, C, AND D)

Source	df	Sum of Squares	Mean Square	F-ratio
Between Groups	3	2,686.70	895.57	5.64**
Within Groups	36	5,713.27	158.70	
Total	39	8,399.98		

**$p < .01$

The differences among the four groups were significant ($p < .01$). To further investigate the findings of Table 5 the Duncan's New Multiple-Range Test (Duncan, 1955; Edwards, 1960) was performed for the four groups. These results are found in Table 6.

Table 6 indicates that Groups A and B differ significantly from Groups C and D, but not from each other. Groups C and D do not differ from each other. It is apparent that the pretest experience influenced both Groups A and B.

TABLE 6

DUNCAN'S NEW MULTIPLE-RANGE TEST SHOWING SIGNIFICANT MEAN COMPARISONS FOR PERCEPTUAL SPEED TASK (GROUPS A, B, C, AND D)

Group	Mean	SD	(1) A 81.82	(2) B 77.92	(3) C 62.72	(4) D 64.85	Shortest Significant Range:
A	81.82	14.21		3.90	19.10*	16.97*	R_2 = 12.22
B	77.92	12.68			15.20*	13.07*	R_3 = 12.85
C	62.72	15.48				-2.13	R_4 = 13.26
D	64.85	5.70					R_5 = 13.55

*Significant Mean Comparisons ($p < .05$) A B C D

"Any two means underscored by the same line do not differ significantly. Any two means not underscored by the same line do differ significantly" (Edwards, 1960, p. 139).

An analysis of variance summary of the perceptual speed task pre- and posttest administration scores for Groups A and B is found in Table 7. The source of variation for the analysis of variance is the between and within subjects comparison for Groups A and B.

TABLE 7

ANALYSIS OF VARIANCE SUMMARY TABLE PRE- AND POSTTEST PERCEPTUAL SPEED TASK (GROUPS A AND B)

Source of Variation	df	Sum of Squares	Mean Square	F-ratio
Between Subjects	19			
A (Groups A and B)	1	18.36	18.36	
Subjects within groups	18	6,038.87	335.49	0.05
Within Subjects	20			
B (Pre-Post)	1	2,013.28	2,013.28	121.20**
AB	1	65.16	65.16	3.92
B x Subjects within groups	18	299.00	16.61	

**$p < .001$

The results of Table 7 indicate a significant ($p < .001$) difference between the pre- and posttest scores for Groups A and B, but the interaction between Groups A and B with pre- and posttest scores does not vary significantly.

Table 26 (Appendix J) illustrates the response changes

across two administrations of the perceptual speed task for Groups A and B. Group A had a mean gain of 16.75; Group B had a mean gain of 11.62. There was a mean gain difference between Groups A and B of 5.125. The tendency was in the direction indicating that the optokinetic experience resulted in better mean scores on the second administration of the perceptual speed task. Table 8 depicts the Mann-Whitney U Test (Siegel, 1956) used to determine the significance of the difference between the gain scores for Groups A and B.

The results of Table 8 indicate that the difference in gain scores for Groups A and B is significant at the .05 level. It would appear that optokinetic training did improve performance on the perceptual speed task when preceded by the pretest experience. The first prediction is supported.

TABLE 8

MANN-WHITNEY U TEST FOR GAIN SCORES ON PERCEPTUAL SPEED TASK (GROUPS A AND B)

Group A Subject	Gain	Rank	Group B Subject	Gain	Rank
A10	24.50	20	B20	11.00	7
A11	14.25	11	B21	20.50	16.5
A12	7.25	4	B22	6.25	2
A13	17.00	14	B23	14.00	10
A14	22.50	19	B24	9.00	6
A15	20.50	16.5	B25	8.75	5
A16	18.75	15	B26	15.25	12
A17	7.25	3	B27	2.00	1
A18	13.25	8	B28	16.00	13
A19	22.25	18	B29	13.50	9
Total	167.5	$R_2 = 128.5$	Total	116.25	$R_1 = 81.5$
Mean	16.75	$U = 26.5^*$	Mean	11.62	

*$p < .05$

Performance on the Closure Flexibility Task

Groups A and B received two administrations of the closure flexibility task; groups C and D received posttest administration only.

Means and standard deviations for Groups A and B on

the pretest administration of the closure flexibility task are found in Table 9.

TABLE 9

PRETEST CLOSURE FLEXIBILITY TASK MEANS AND STANDARD DEVIATIONS (GROUPS A AND B)

Group	N	Mean	SD
A	10	101	17.50
B	10	90	29.90

An analysis of variance was performed to determine whether the difference in pretest mean scores between Groups A and B was significant. The results of that analysis are found in Table 10.

TABLE 10

PRETEST CLOSURE FLEXIBILITY TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A AND B)

Source	df	Sum of Squares	Mean Square	F-ratio
Between Groups	1	594.05	594.05	0.99
Within Groups	18	10,802.92	600.16	
Total	19	11,396.96		

The F-ratio for the results of Table 10 was not significant. It would appear that Groups A and B did not differ significantly on the pretest measure of the closure flexibility task.

Table 11 depicts the means and standard deviations for Groups A, B, C, and D on the posttest administration of the closure flexibility task. There was no pretest administration for Groups C and D for this task.

TABLE 11

POSTTEST CLOSURE FLEXIBILITY TASK MEANS AND STANDARD DEVIATIONS (GROUPS A, B, C, AND D)

Group	N	Mean	SD
A	10	133.90	22.13
B	10	116.80	39.59
C	10	83.40	23.93
D	10	75.80	23.36

The analysis of variance performed on the posttest scores for all groups is found in Table 12.

TABLE 12

POSTTEST CLOSURE FLEXIBILITY TASK ANALYSIS OF VARIANCE SUMMARY TABLE (GROUPS A, B, C, AND D)

Source	df	Sum of Squares	Mean Square	F-ratio
Between Groups	3	22,681.47	7,560.49	9.58***
Within Groups	36	28,574.57	793.74	
Total	39	51,256.04		

***p < .001

Table 12 shows a F-ratio of 9.58 which was significant at the .001 level, indicating variability among the four groups.

To clarify the results of Table 12, and test the significance of the difference between pairs of means, Duncan's New Multiple-Range Test (Duncan, 1955; Edwards, 1960) was employed. Table 13 shows the results of this test.

The results of Table 13 indicate that Groups A and B differ significantly from Groups C and D, but not from each other. Groups C and D do not differ significantly from each other. Therefore, the pretest experience again served to differentiate Groups A and B from Groups C and D.

TABLE 13

DUNCAN'S NEW MULTIPLE-RANGE TEST SHOWING SIGNIFICANT MEAN COMPARISONS FOR POSTTEST CLOSURE FLEXIBILITY TASK (GROUPS A, B, C, AND D)

Group	Mean	SD	(1) A 133.90	(2) B 116.80	(3) C 83.40	(4) D 75.80	Shortest Significant Range:
A	133.90	22.13		17.10	50.50*	58.10*	R_2 = 32.0
B	116.80	39.59			33.40*	41.00*	R_3 = 33.9
C	83.40	23.93				7.80	R_4 = 34.8
D	75.80	23.36					R_5 = 35.7

*Significant Mean Comparisons ($p < .05$) A B C D

"Any two means underscored by the same line do not differ significantly. Any two means not underscored by the same line do differ significantly" (Edwards, 1960, p. 139).

The analysis of variance summary table for pre- and posttest closure flexibility task scores between and within subjects for Groups A and B is illustrated by Table 14.

TABLE 14

ANALYSIS OF VARIANCE SUMMARY TABLE PRE- AND POSTTEST CLOSURE FLEXIBILITY TASK (GROUPS A AND B)

Source of Variation	df	Sum of Squares	Mean Square	F-ratio
Between Subjects	19			
A (Groups A and B)	1	1,960.16	1,960.16	
Subjects within groups	18	28,240.00	1,568.89	1.25
Within Subjects	20			
B (Pre-Post)	1	8,880.47	8,880.47	148.91**
AB	1	96.21	96.21	1.61
B x Subjects within groups	18	1,073.44	59.64	

**$p < .001$

The F-ratio of the comparison between the pre- and posttest scores indicates that Groups A and B scores differed significantly ($p < .001$).

To further explore the differences between the pre- and posttest performance on the closure flexibility task, Table 27 (Appendix J) illustrates the response changes across two administrations of the closure flexibility task, for Groups A and B. The mean gain score for Group A was 32.9; Group B,

26.7. The difference between the mean gain scores for Groups A and B was 6.2. Table 21 illustrates the use of the Mann-Whitney U Test (Siegel, 1956) to determine the significance of the difference between the mean gain scores for Groups A and B.

TABLE 15

MANN-WHITNEY U TEST FOR GAIN SCORES ON CLOSURE FLEXIBILITY TASK (GROUPS A AND B)

Group A Subject	Gain	Rank	Group B Subject	Gain	Rank
A10	47	20	B20	6	1
A11	28	9	B21	45	18
A12	30	10	B22	40	16.5
A13	18	2.5	B23	35	14
A14	46	19	B24	19	4
A15	33	12.5	B25	33	12.5
A16	27	8	B26	20	5.5
A17	22	7	B27	18	2.5
A18	38	15	B28	31	11
A19	40	16.5	B29	20	5.5
Total	329	$R_2 = 119.5$	Total	267	$R_1 = 90.5$
N	10		N	10	
Mean	32.9	$U = 35.5$	Mean	26.7	

The U of 35.5 was not significant. The trend was in the direction of significance, but required a score of less than 26.7 to be significant. It would appear that opto-kinetic training did not improve performance on the closure flexibility task. The second prediction was not supported.

Performance on the Picture Differentiation Task

As explained in Chapter III, a measure was taken of the ability to differentiate items from a target picture. The picture differentiation scores for each subject are presented in Appendix H, Tables 37 and 38.

In response to the open-ended instructions "write what you see in the picture" some of the subjects chose listing as their response vehicle while the remainder chose a text response. In each group there was a split in response style between list and text responses. The list and text responses are for the most part treated separately statistically.

Table 16 and Table 28 (Appendix J) indicate the means and standard deviations for the pretest administration of the picture differentiation task for Groups A and B separated in terms of whether the subject used the list or text style of response.

TABLE 16

PRETEST PICTURE DIFFERENTIATION TASK MEANS AND STANDARD DEVIATIONS (GROUPS A AND B)

Group	N	Mean	SD
Group A (Row 1)	10		
List (Col 1)	7	19.29	8.56
Text (Col 2)	3	38.33	9.81
Group B (Row 2)	10		
List (Col 1)	3	35.00	19.98
Text (Col 2)	7	43.14	13.61

An analysis of variance was computed and the results of that analysis are found in Table 17.

TABLE 17

ANALYSIS OF VARIANCE SUMMARY TABLE FOR GROUPS A AND B, LIST AND TEXT PRETEST PICTURE DIFFERENTIATION TASK

Source	df	Sum of Square	Mean Square	F-ratio
Group A, B (Rows)	1	442.28	442.28	2.78
List, Text (Cols)	1	776.29	776.29	4.89*
Interaction	1	124.87	124.87	0.79
Within	16	2,540.96	158.81	

*$p < .05$

The significant F-ratio ($p < .05$) found in Table 17 indicates that responses on the pretest administration of the picture differentiation task were slightly longer for the textual style response than the listing style of approach.

Tables 18 and 29 (Appendix J) illustrate the means and standard deviations for the posttest administration of the picture differentiation task for all groups separated by list-text categories of response.

TABLE 18

MEANS AND STANDARD DEVIATIONS FOR POSTTEST PICTURE DIFFERENTIATION TASK (ALL GROUPS)

Group	N	Mean	SD
Group A (Row 1)	10		
List (Col 1)	7	23.57	10.80
Text (Col 2)	3	51.67	8.39
Group B (Row 2)	10		
List (Col 1)	6	41.50	16.84
Text (Col 2)	4	42.00	13.17
Group C (Row 3)	10		
List (Col 1)	4	23.75	11.30
Text (Col 2)	6	32.67	14.21
Group D (Row 4)	10		
List (Col 1)	5	27.20	18.43
Text (Col 2)	5	37.80	9.34

An analysis of variance was performed on scores obtained for all groups and categories of response, the results of which appear in Table 19.

TABLE 19

ANALYSIS OF VARIANCE SUMMARY TABLE FOR GROUPS A, B, C, AND D LIST AND TEXT POSTTEST PICTURE DIFFERENTIATION TASK

Source	df	Sum of Squares	Mean Square	F-ratio
Group ABCD (Rows)	3	980.87	326.96	1.78
List, Text (Cols)	1	1,354.09	1,354.09	7.37*
Interaction	3	942.35	314.12	1.71
Within	32	5,877.57	183.67	

*$p < .05$

The significant F-ratio of 7.37 ($p < .05$) indicated that subjects using a text response showed a greater output than the listers.

Response changes across two administrations of the picture differentiation task for Groups A and B are illustrated in Table 30 (Appendix I). Group A has a mean gain of 7 and Group B has a mean gain of 3. There is a difference of 4 between the mean gain scores for Groups A and B.

The Mann-Whitney U test was performed to determine whether the difference between groups was significant and the results of this test are found in Table 29.

The results of the Mann-Whitney U Test show a U of 45 which is not significant. Therefore, although there is a difference between Groups A and B, it is not of a magnitude necessary to qualify as significant.

Tables 30 and 31 (Appendix I) depict the response changes across two administrations of the picture differentiation task for Groups A and B Listing category of response.

An inspection of Table 31 shows that Group A (List) had a mean gain of 4.28; Group B (List) had a mean gain of 2.67. There was a difference between Groups A and B mean gain scores of 1.61 in favor of Group A.

TABLE 20

MANN-WHITNEY U TEST FOR GROUPS A AND B GAIN SCORES ON PICTURE DIFFERENTIATION TASK

Group A Subject	Gain	Rank	Group B Subject	Gain	Rank
A10	8	13	B20	9	14
A11	15	18	B21	2	6.5
A12	7	11.5	B22	1	5
A13	13	16	B23	4	9
A14	5	10	B24	2	6.5
A15	0	3.5	B25	-27	1
A16	0	3.5	B26	-16	2
A17	12	15	B27	14	17
A18	7	11.5	B28	24	20
A19	3	8	B29	17	19
Total	70	$R_2 = 110$	Total	30	$R_1 = 100$
N	10		N	10	
Mean	7	U = 45	Mean	3	

The results of the Mann-Whitney U Test performed to determine the significance of the difference in gain scores for subjects in Groups A and B (list) response are illustrated by Table 21.

TABLE 21

MANN-WHITNEY U TEST FOR PICTURE DIFFERENTIATION PRE-POST GAIN SCORES GROUPS A AND B (LIST)

Group A Subject	Gain	Rank	Group B Subject	Gain	Rank
A10	8	10	B21	2	3.5
A12	7	8.5	B23	4	6
A14	5	7	B24	2	3.5
A15	0	1.5			
A16	0	1.5			
A18	7	8.5			
A19	3	5			
Total	30	$R_1 = 42.0$	Total	8	$R_2 = 13.0$
N	7		N	3	
Mean	4.28	$U = 14$	Mean	2.67	$U' = 7$

The Mann-Whitney U Test of the significance of the difference in gain scores for Groups A and B (List) yields a U of 7 which is not significant.

Table 22 depicts the response changes across two administrations of the picture differentiation task for Groups A

and B subjects who used the text response.

Examination of Table 32 (Appendix J) shows that the mean gain for Group A is 13.33; Group B, 12.75. Group A has a mean gain of .58 greater than Group B.

The results of the Mann-Whitney U Test performed to determine the significance of the difference in gain scores between Groups A and B subjects who used the text response is shown in Table 22.

TABLE 22

MANN-WHITNEY U TEST PICTURE DIFFERENTIATION TASK
GROUPS A AND B PRE-POST GAIN SCORES (TEXT)

Group A Subject	Gain	Rank	Group B Subject	Gain	Rank
A11	15	5	B20	9	2
A13	13	4	B22	1	1
A17	12	3	B28	24	7
			B29	17	6
Total	40	$R_1 = 12$	Total	51	$R_2 = 16$
N	3		N	4	
Mean	13.33	U = 6	Mean	12.75	U'=6

The Mann-Whitney U Test of the significance of the difference in gain scores for Groups A and B (Text) yields a U of 6 which is not significant. The third prediction is not supported.

Intercorrelation Analysis

In order to determine the relationship between the pre- and posttest administrations of the three perceptual tasks, an intercorrelation matrix was computed. Table 33 (Appendix J) shows the means and standard deviations for pre- and posttest administrations of the perceptual speed, closure flexibility, and picture differentiation tasks. Table 34 (Appendix J) illustrates the intercorrelations between pre- and posttest scores for the same task with pre- and post-test scores for the other tasks.

The intercorrelation analysis shown in Table 34 (Appendix J) indicates:

1. The Groups A and B subjects who received the pre- and posttest administrations of the perceptual speed task show a correlation coefficient of .89 ($p < .01$) which indicates the high test-retest reliability of the Perceptual Speed Test despite the change in the mean performance.

2. The pre-post correlation for the closure flexibility task has a high correlation coefficient (.96, significant at the .01 level) which indicates the high test-retest reliability of the Closure Flexibility Test.

3. The pre-post relationship for the picture differentiation task yields a correlation coefficient of .79 ($p < .01$) which reflects the change in response mode for three subjects in Group B primarily and, therefore, a sharp reduction in score from pre-post. However, it still shows a sufficient test-retest reliability level.

4. The perceptual speed and closure flexibility tasks are highly correlated with each other. The correlation of pretest measurements for these two tasks yields a correlation coefficient of .59 ($p < .01$); posttest comparison, .73 ($p < .01$).

5. Pretest closure flexibility and pretest picture differentiation yield a negative correlation coefficient of -.43 which is not significant.

6. Posttest closure flexibility and posttest picture differentiation show no correlation, $r = 0.00$.

7. Pretest perceptual speed correlated with pretest picture differentiation is .16 and not significant.

8. Posttest perceptual speed correlated with posttest picture differentiation is .17 and not significant.

9. Pretest picture differentiation and posttest closure flexibility yield a negative correlation coefficient of -.48 which is significant at the .05 level.

Discussion

Prediction One.--The first prediction set forth by the present study stated, "Optokinetic training will improve performance on the perceptual speed task." In reviewing the findings of this study, an analysis of variance for Groups A and B showed that they did not differ initially on the perceptual speed task (Table 3). Although both groups improved their performance on the second administration of the PS task, Group A which received the optokinetic experience

showed a statistically significant gain (Table 8). Comparing the posttest performance for Groups A, B, C, and D, the differences among groups were significant at the .01 level (Table 5). The Duncan's New Multiple-Range Test showed that Groups A and B differed significantly ($p < .05$) from Groups C and D, but not from each other (Table 6). There was a significant ($p < .001$) difference between pre- and posttest scores for Groups A and B (subjects), but statistical interaction between Groups A and B (subjects) was not significant (Table 7). The Mann-Whitney U Test showed that Group A had a significantly ($p < .05$) higher mean gain score (Table 8).

Significant differences were discovered between Group A which received the optokinetic experience and Group B which did not, but Group C which also received the optokinetic experience without the pretesting experience did not differ from Group D which received neither. Apparently the pretesting experience served to provide a mental or perceptual set which was enhanced by the optokinetic experience as shown by the posttest performance.

In summary, then, optokinetic training did significantly improve performance on the perceptual speed task when it was preceded by the pretest perceptual experience which supported the first prediction.

Prediction Two.--The second prediction stated, "Optokinetic training will improve performance on the closure flexibility task." In reviewing the findings of this study,

analysis of variance indicated that Groups A and B did not differ initially on the CF task (Table 10). Although both groups improved their performance on the second administration of this task, they did not differ significantly on the posttest administration of the CF task. In comparing the posttest performance for Groups A, B, C, and D, the differences among groups was significant ($p < .001$) (Table 12). The Duncan's New Multiple-Range Test showed that Groups A and B differed significantly ($p < .05$) from Groups C and D, but not from each other (Table 13). There was a significant ($p < .001$) difference between pre- and posttest scores for Groups A and B (subjects), but interaction between Groups A and B (subjects) was not significant (Table 14). The Mann-Whitney U Test showed a trend in the direction favoring Group A and this prediction, but the U was just short of significance.

Although the trend in the above results was in the direction favoring this prediction, the trend must be qualified by the following observations. Group A receiving the optokinetic experience did show a greater pre-post gain on this task than did Group B which did not have the optokinetic experience. Group C which received the optokinetic experience did in this case differ from Group D. Despite the fact that experimental Groups A and C did differ from control Groups B and D, it was not of sufficient magnitude to be statistically significant.

In summary, although optokinetic training did improve performance on the closure flexibility task, the results of

the present study do not support this prediction statistically.

Prediction Three.--The third prediction stated, "Optokinetic training will facilitate performance on the perceptual (Picture) differentiation task." This prediction was based on the assumption that if a third characteristic of the open perceptual field was the individual's capacity to accept into awareness any and all aspects of reality (Combs, 1962), then perhaps one index of this characteristic might be the individual's ability to differentiate details with a complex figure-ground configuration such as a picture.

In reviewing the findings of this study, the analysis of variance Groups A and B did not differ initially (Table 17), but the list and text response subjects did differ significantly ($p < .05$) on the pretest administration of the picture differentiation task (Table 17). Posttest administration of the picture differentiation task again showed a significant ($p < .05$) difference between text and list, but not among Groups A, B, C, and D (Table 19). Although Group A had a higher mean gain, the Mann-Whitney U Test (Table 20) is not significant. Using the Mann-Whitney U Test on Groups A and B separated by list and text response categories (Tables 21 and 22), the results are not significant although Group A has higher gain scores in both categories.

There is a slight tendency in the direction of support for this prediction which indicates that differentiation of details and written response to those details within a limited

time period did increase (Table 30, Appendix J). Both Group A list and text subjects showed a greater gain pre-post than Group B list and text subjects; both differences were not significant.

In summary, then, optokinetic training did not improve performance on the picture differentiation task, and the third prediction was not supported.

Intercorrelation Analysis.--One of the problems connected with the study of openness of the perceptual field has been the necessity of using several measures of perceptual performance in order to measure openness of the perceptual field which is a holistic, multi-dimensional construct. The three tasks examined in this study were chosen because they had potential utility in exploration and further explication of this holistic, subjective construct and to reflect various characteristics of the open perceptual field.

In reviewing the findings of this study, Table 34 shows that there was significant ($p < .01$) pre-post correlations for the perceptual speed, closure flexibility, and picture differentiation tasks indicating high test-retest reliability for each task. The perceptual speed and closure flexibility tasks were highly correlated with each other ($p < .01$). Since the Closure Flexibility Test is considered a measure of Thurstone's (1944) "second closure factor" which concerns the individual's ability to hold a configuration in mind despite distraction, and perceptual

speed is considered to embody several sub-factors, it seems likely that part of the reason for the high correlation between the perceptual speed closure flexibility tasks lies in the fact that they measure similar attributes, attributes with components in common, and a facilitating relationship while still remaining somewhat distinct and separate entities.

The picture differentiation task, on the other hand, was negatively correlated ($p < .05$) with the post-closure flexibility task which indicates that the high closure flexibility subjects were more likely to list or be less fluent verbally in their response to the picture differentiation task. There was little or no correlation between the picture differentiation task and the other variables. This suggests that the picture differentiation task measured a different aspect of the perceptual-behavioral process.

Summary

The prediction that optokinetic training would improve performance on the perceptual speed task was supported.

The prediction that optokinetic training would improve performance on the closure flexibility task was not supported.

The prediction that optokinetic training would improve performance on the picture differentiation task was not supported.

In general, the findings of this study would seem to indicate that:

1. Optokinetic training did improve performance on the perceptual speed task.

2. Optokinetic training did not significantly improve performance on the closure flexibility task, although the results showed a tendency in that direction.

3. Optokinetic training did not improve performance on the picture differentiation task.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The purpose of this research was the investigation of some of the effects of optokinetic training on openness of the perceptual field. Impetus for this study came originally from the findings of humanistic and perceptual psychologists and current emphasis on training and the provision of enriched experiences directed toward greater actualization of human potential.

The term optokinetic training referred to a training experience using an optokinetic perceptual learning device to induce the optokinetic reflex eye movement, nystagmus, in response to the rapid presentation of a complex visual stimulus. Openness of the perceptual field referred to the capacity of the individual for (1) change and adjustment, (2) acceptance of information into awareness, and (3) relative freedom from defense and distortion within his perceptual field.

For purposes of the present study perceptual openness was measured by performance on three perceptual tasks: perceptual speed, closure flexibility, and perceptual (picture) differentiation. Since all three tasks were dependent on

visual perception, it was hypothesized that the optokinetic training experience would increase performance on the three tasks. Three specific results were predicted:

1. Optokinetic training will improve performance on the perceptual speed task.

2. Optokinetic training will improve performance on the closure flexibility task.

3. Optokinetic training will improve performance on the perceptual (picture) differentiation task.

The Sample

The sample was drawn from the population of the 1968 summer enrollment at the University of Florida. Forty paid volunteer subjects were assigned to four ten-person experimental treatment groups by means of a table of random numbers. There were 23 males and 17 females in the study. The mean age was 28; median, 21; and mode, 19 years. Sixteen different academic majors were represented.

Design of the Study

The three perceptual tasks were selected to reflect various aspects of the open perceptual field. The Perceptual Speed test required subjects to rapidly compare configurations and identify two figures as similar or identical. The Closure Flexibility test required the subject to find a given configuration (diagram, drawing, or figure) which is 'hidden' or embedded in a larger, more complex configuration. The perceptual (picture) differentiation task required the subject to search for details within a complex figure-

ground configuration, i.e., perceptual differentiation. The target picture was Seurat's Sunday Afternoon on the Island of La Grande Jatte.

The four treatment groups included: (1) Group A, pretest posttest administration of the closure flexibility, perceptual speed, and picture differentiation tasks with optokinetic training; (2) Group B, pretest posttest administration of the three perceptual tasks with no optokinetic training; (3) Group C, optokinetic training with posttest only; and (4) Group D, posttest only.

All experimental tasks were administered during the same testing period. Test sessions lasted from 30 to 60 minutes.

Treatment of Data

Statistical procedures utilized in analyzing the data included analysis of variance, Duncan's New Multiple-Range Test, and the Mann-Whitney U Test, and intercorrelation analysis.

Results

Of the three specific predictions, only prediction one regarding the effect of optokinetic training on perceptual speed was confirmed.

In relation to the stated predictions, the following was found:

1. Optokinetic training did improve performance scores on the perceptual speed task. There was a statistically significant difference between Groups A and B which supported

this prediction.

2. Optokinetic training did not improve performance scores on the closure flexibility task to a statistically significant degree, although the results showed a tendency in that direction. The second prediction was not supported.

3. Optokinetic training did not improve performance on the perceptual (picture) differentiation task to a statistically significant degree. The third prediction was not supported.

Conclusions

In general, the findings suggested that:

1. The optokinetic training experience did improve performance on the perceptual speed task when the task to be performed had been previously experienced perhaps providing a perceptual set. The individual's perceptual speed or speed in finding figures, making comparisons, and carrying out other simple tasks involving visual perception could be increased to a certain extent by the optokinetic experience.

2. Optokinetic training did not improve performance on the closure flexibility task to a statistically significant degree. The individual's closure flexibility or ability to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions was only modified to a certain extent, although there was a tendency in that direction.

3. Optokinetic training did not improve performance on the picture differentiation task to a statistically significant degree regardless of whether it was a list or text response. The individual's ability to differentiate details from a complex figure-ground configuration and the verbal fluency of his written response was not improved, although the results showed a slight tendency in that direction.

Other observations indicated that:

1. Closure flexibility, perceptual speed, and picture differentiation tasks had high test-retest reliability coefficients.

2. There was a significant relationship between the performance on the pre- and posttest administrations of the perceptual speed and closure flexbility task. The perceptual speed and closure flexibility tasks correlated significantly ($p < .01$) with each other.

3. There was no general relationship between response to the picture differentiation task and the other two tasks. The picture differentiation task correlated negatively or not at all with the other tasks.

Implications

The present study treated the optokinetic experience in a holistic fashion which now needs further analysis, investigation, and refining. The following variables adapted from Holland (1965) are relevant to further inves-

tigation and development of optokinetic training:

1. Psychophysical variables

a. Size of display and/or frequency of stimulation of receptor elements.

b. Structure and function of the device (OKLD).

c. Its degree of complexity (pattern or visual array).

d. Illumination of the stimulus pattern and/or the degree of brightness and contrast.

2. Programme variables

a. Degree of distribution of massing of trials.

b. Direction of rotation.

c. Length of stimulation.

d. Whether binocular or monocular vision is employed during the stimulation phase and/or whether the contra-lateral transfer technique might be used.

e. Differences in the emphases of the operating criteria set by the experimenter during his instruction to the subject.

3. Subject sources of variability

a. Integrity and capacity of his nervous system. For example, the poor performance on the Archimedes spiral for known deviants, retarded, brain damaged, and senile individuals.

b. The characteristic mode of response (personality).

c. His drive or desire for achievement.

d. Age, intelligence and perhaps sex.

e. The degree of anxiety under which the individual may be burdened habitually or at the time of the experiment.

f. How suggestable the individual is in ambiguous situations.

g. How tolerant of ambiguity he may be.

h. The effect of drugs as they affect the neural chemistry of the individual.

i. Simpler determinants such as visual acuity and eye movements.

j. Multiple and complex features of attention-inattention.

In addition, research designed to discover the most effective variables and combination of variables for different purposes, i.e., relaxation or stimulation and activation of the individual, are important lines of research suggested by the present study. Another valuable line of research would be the use of electrophysiological measures such as EEG, EOG, D. C. level and perhaps even evoked potentials recorded before, after, and during the optokinetic experience in order to better understand the physiological correlates of the perceptual-cognitive responses to optokinetic stimulation such as used in the present study.

Dimensions of the device itself could be altered. For example, Rademaker and Ter Braak (1948, cited in Monnier, 1967) have distinguished two levels of optokinetic nystagmus

depending on the whole or partial occupation of the visual field which was discussed in Chapter II. Therefore, a larger drum would occupy a greater portion of the individual's visual field and perhaps would have a somewhat different effect. Variations in r.p.m. steady or accelerated, configurations of the design (size and complexity of the pattern, presence of meaning in the pattern either verbal or symbolic, and density of the interfaces or edge contrasts among the details in the visual array), light source (direction, diffusion, reflection, refraction or radiation, intensity and brightness of the light, intermittent light source such as stroboscopic effects or presence of flicker, light-dark contrasts of the moving shadows, and wave lengths of the light or color), etc.

Since the theoretical position on which the present study is based states that openness of the perceptual field is a function of previous perceptual experience, and each perceptual experience builds on the last one, it seems reasonable to assume that expanding perceptual openness and awareness is an evolving process which might be enhanced by repeated optokinetic training experiences. Therefore, further research might include a longitudinal study of some of the effects of optokinetic training on openness of the perceptual field. The following are possible approaches to longitudinal investigations of the optokinetic training experience:

1. Longitudinal study with repeated testing.

2. Follow-up studies of the same or similar subjects.

3. A series of training sessions and repeated measurement, physiological and/or psychological, to determine the presence of and length of the residual effects of the optokinetic experience or experiences over time (minutes, hours, days, etc.).

4. The effects of lengthening or shortening the duration of the optokinetic experience itself.

5. The subjects for the present study were for the most part young adults. When more is known about the optokinetic experience phenomenon and its effects, developmental studies of subjects receiving the optokinetic training experience during their early formative years, periods of maximum growth and development might be fruitful avenues of research.

The present study needs to be replicated using a larger sample, a sample drawn from a different population, and another investigator. Possible changes in the research design include: (1) sample controlled for age, sex, and academic major; (2) response to the perceptual (picture) differentiation task restricted by instruction to either a listing or textual response; (3) response to the picture differentiation task tape recorded; and (4) random order of the perceptual tasks. Other cognitive-perceptual tasks might also be useful measures of the effects of the optokinetic training experience as well as introspective reports from the subjects.

In summary, much more research and experimentation need to be done before the effects of the optokinetic training experience on perceptual openness, especially perceptual speed, and related processes can be fully understood and utilized. The results of the present study, in the opinion of the Investigator, seem sufficiently promising to warrant further research in the area of optokinetic training, and its possible contributions to the actualization of human potential.

APPENDIX A

Instructions for Administering Experimental Procedures

(Group A)

APPENDIX A

Instructions for Administering Experimental Procedures (Group A)

I. GENERAL INSTRUCTIONS

This is a study of visual perception. I am going to ask you to do several things.

First, you will work three short tests.

Second, for a short time you will watch a revolving drum with printed pages on it.

After that you will take the same three tests again, and that will be all.

II. SETTING

People vary a great deal within the normal range on these tests. Do the best you can, but don't get "up-tight." Please do not discuss this with anyone until the study is completed.

III. SPECIFIC INSTRUCTIONS (PRE-TEST)

Perceptual Speed

A. Here is the first test. Please fill in the blanks at the top of the page and read the directions.

All right now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture B. Here is a picture by Seurat.

Please write your name at the top.

In the spaces provided, write what you see in the picture.

Begin. (2 min.)

(Stop)

Closure Flexibility C. Here is the third test. Please fill in the blanks at the top of the page and read the directions.

Read the rest of the directions.

Ready?

Begin. (10 min.)

(Stop)

IV. OPTOKINETIC TRAINING DEVICE

1. You see before you an Optokinetic Training Drum which provides a visual experience. Sit facing the drum so that you are looking at the side of the drum.

2. Sitting in a relaxed position gaze intently, but in a relaxed manner at the visual design.

3. Count sub-vocally, to yourself, to block the reading response. Count 1 - I am, 2 - I am, 3 - I am and so forth through to ten slowly and begin again. Do not worry if you should lose count, merely begin your count again. In other words, just let it happen. Are there any questions? (one minute at 16 r.p.m.; five minutes at 33 1/3 r.p.m.)

4. (Following the time period above, the turn-

table was turned off and the subject allowed to respond to the experience as he seemed inclined to do so.)

V. SPECIFIC INSTRUCTIONS (POSTTEST)

Perceptual Speed

Here are the three tests you worked before.

A. Please fill in the blanks at the top of this one and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture

B. Here is the picture. Please write your name at the top.

In the spaces provided, write what you see in the picture.

Begin. (2 min.)

(Stop)

Closure Flexibility

C. Here is the third test. Again fill in the blanks at the top of the page and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (10 min.)

(Stop)

APPENDIX B

Instructions for Administering Experimental Procedures

(Group B)

APPENDIX B

Instructions for Administering
Experimental Procedures (Group B)

I. GENERAL INSTRUCTIONS

This is a study of visual perception.

I am going to ask you to do several things.

First, you will work three short tests.

And after that you will take the same three tests again, and that will be all.

II. SETTING

People vary a great deal within the normal range on these tests. Do the best you can, but don't get "up-tight." Please do not discuss this with anyone until the study is completed.

III. SPECIFIC INSTRUCTIONS (PRE-TEST)

Perceptual Speed

A. Here is the first test.

Please fill in the blanks at the top of the page and read the directions.

All right now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture B. Here is a picture by Seurat.

Please write your name at the top.

In the spaces provided, write what you see in the picture.

Begin. (2 min.)

(Stop)

C. Here is the third test. Please fill in the blanks at the top of the page and read the directions.

Read the rest of the directions.

Ready?

Begin. (10 min.)

(Stop)

IV. SPECIFIC INSTRUCTIONS (POSTTEST)

Perceptual Speed Here are the three tests that you worked before.

A. Please fill in the blanks at the top of this one and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture B. Here is the picture.

Please write your name at the top.

In the spaces provided, write what you see in the picture.

Begin. (2 min.)

(Stop)

Closure Flexibility C. Here is the third test.

Again fill in the blanks at the top of the page and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (10 min.)

(Stop)

APPENDIX C

Instructions for Administering Experimental Procedures

(Group C)

APPENDIX C

Instructions for Administering Experimental Procedures (Group C)

I. GENERAL INSTRUCTIONS

This is a study of visual perception.

I am going to ask you to do several things.

First, you will look at a revolving drum with printed pages on it.

After that you will take three short tests and that will be all.

II. SETTING

People vary a great deal within the normal range on these tests. Do the best you can, but don't get "up-tight." Please do not discuss this with anyone until the study is completed.

III. OPTOKINETIC TRAINING DEVICE

1. You see before you an Optokinetic Training Drum which provides a visual experience. Sit facing the drum so that you are looking at the side of the drum.

2. Sitting in a relaxed position gaze intently, but in a relaxed manner at the visual design.

3. Count sub-vocally, to yourself, to block the reading response. Count 1 - I am, 2 - I am, 3 - I am

and so forth through to ten slowly and begin again. Do not worry if you should lose count, merely begin your count again. In other words, just let it happen. Are there any questions? (one minute at 16 r.p.m.; five minutes at 33 1/3 r.p.m.).

4. (Following the time period above, the turntable was turned off and the subject allowed to respond to the experience as he seemed inclined to do so.)

IV. SPECIFIC INSTRUCTIONS (POSTTEST)

Here are the three tests that you worked before.

Perceptual Speed

A. Please fill in the blanks at the top of this one and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture

B. Here is the picture. Please write your name at the top.

In the spaces provided, write what you <u>see</u> in the picture.

Begin. (2 min.)

(Stop)

Closure Flexibility

C. Here is the third test.

Again fill in the blanks at the top of the page and read the directions.

Now read the rest of the directions.

Are you ready?

Begin. (10 min.)

(Stop)

APPENDIX D

Instructions for Administering Experimental Procedures

(Group D)

APPENDIX D

Instructions for Administering
Experimental Procedures (Group D)

I. GENERAL INSTRUCTIONS

This is a study of visual perception.

I am going to ask you to do several things.

You will take three short tests and that will be all.

II. SETTING

People vary a great deal within the normal range on these tests. Do the best that you can, but don't get "up-tight." Please do not discuss this with anyone until the study is completed.

III. SPECIFIC INSTRUCTIONS (PRE-TEST)

Perceptual Speed

A. Here is the first test. Please fill in the blanks at the top of the page and read the directions.

All right now read the rest of the directions.

Are you ready?

Begin. (5 min.)

(Stop)

Picture

B. Here is a picture by Seurat.

Please write your name at the top.

In the spaces provided, write what you <u>see</u> in the picture.

Begin. (2 min.)

(Stop)

Closure Flexibility C. Here is the third test.

Please fill in the blanks at the top of the page and read the directions.

Read the rest of the directions.

Ready?

Begin. (10 min.)

(Stop)

APPENDIX E

Directions for Perceptual Speed Test and Sample Items

Please fill in:

Name_____

Age_____ Sex ___ Date____

Occupation_____

_____

P E R C E P T U A L

S P E E D
(IDENTICAL FORMS)

Developed by: L. L. Thurstone, Ph.D. & T.E. Jeffrey, Ph.D.
The Psychometric Laboratory
The University of North Carolina

D i r e c t i o n s

This booklet contains problems like those shown in the sample below. The first figure in each line is followed by five numbered figures. In the blank space at the right of each line, write the number of the figure which is exactly like the first in the line. In the sample below, the first two blank spaces have been filled in correctly. You fill in the other three. Go right ahead. When you are finished, the examiner will tell you the correct answers. DO NOT TURN THE PAGE until you get the signal to do so.

SAMPLE PRACTICE

(Figure 2)

WHEN YOU GET THE SIGNAL TO BEGIN, turn the page and mark more problems of the same kind. Work as fast and as accurately as you can, but do not guess. Wrong answers will count against you. You are not expected to finish in the time allowed. You will have exactly five minutes to do as much as you can.

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The University of Chicago 1225 E. 60th Street
Chicago, Illinois 60637

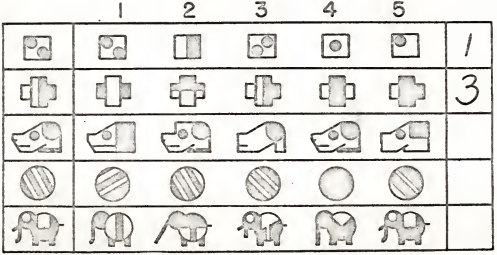


Figure 2. Perceptual Speed Test sample items.

APPENDIX F

Directions for Closure Flexibility Test and Sample Items

Please fill in:

Name_____

Age___ Sex___ Date_____

Occupation_____

_____

_____

C L O S U R E

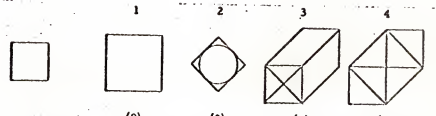
F L E X I B I L I T Y

(CONCEALED FIGURES)
(FORM A)

Developed by: L. L. Thurstone, Ph.D. and T. E. Jeffrey, Ph.D.
The Psychometric Laboratory
The University of North Carolina

D i r e c t i o n s:

The row of designs below is a sample item of this test. The parts have been labeled to make description easier. These labels do not appear in the test items. The left hand design in each row is the figure. You are to decide whether or not the figure is concealed in each of the four drawings to the right. Put a check mark (✓) in the parentheses under a drawing, if it contains the figure. Put a zero (0) in the parentheses under a drawing, if it does not contain the figure. Look at the row of designs below.



In the row above a zero (0) has been written in the parentheses under drawing 1. The first drawing is a square but it is larger than the figure. A zero (0) has been written under drawing 2. Although the second drawing contains a square of exactly the same size as the figure, it has been turned. Check marks (✓) have been written under the third and fourth drawings since they each contain a square of exactly the same size as the figure and have not been turned. It does not matter than the figure contained in drawings three and four is on a different level from the figure at the left.

S a m p l e:

Here is another example for practice. Try it.

( ) .( ) ( ) ( )

You should have placed a check mark (✓) in the parentheses under the first and third drawings and zeros (0) in the parentheses under the second and fourth drawings.

WHEN YOU GET THE SIGNAL TO BEGIN, turn the page and mark more problems of the same kind. Work as fast and as accurately as you can, but do not guess. Wrong answers will count against you. You are not expected to finish in the time allowed. You will have exactly ten minutes to do as much as you can.

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Published by Industrial Relations Center, 1225 E. 60 Street
Chicago, Illinois 60637

APPENDIX G

Directions for the Picture Differentiation Task and Sample Picture

Seurat, G. Sunday Afternoon on the Island of La Grande Jatte (Canady, 1959).

In the spaces provided write what you see in the picture.

Figure 3. Perceptual differentiation task sample picture.

APPENDIX H

Descriptive and Experimental Data

TABLE 23

DESCRIPTION OF THE SAMPLE

Subject	Sex	Age	Academic Major	Subject	Sex	Age	Academic Major
A10	M	21	Bus. Admin.	C30	M	20	Psychology
A11	M	25	Psychology	C31	M	19	Journalism
A12	F	19	Psychology	C32	M	21	Bus. Admin.
A13	F	23	Education	C33	M	20	Pol. Science
A14	M	19	Architecture	C34	F	26	Education
A15	M	31	Architecture	C35	M	20	Pre. Med.
A16	M	21	Int. Desgn.	C36	M	28	English
A17	M	20	Architecture	C37	M	25	Education
A18	M	19	Architecture	C38	M	27	Architecture
A19	F	23	Int. Desgn.	C39	F	20	Fine Arts
B20	M	24	History	D40	M	24	Sociology
B21	M	22	Architecture	D41	F	22	Education
B22	M	19	Chemistry	D42	F	20	Int. Desgn.
B23	F	19	Philosophy	D43	F	21	History
B24	F	23	English	D44	M	20	Physics
B25	F	21	English	D45	M	53	Education
B26	F	19	Engl. Lit.	D46	F	20	Nursing
B27	M	20	Psychology	D47	F	19	Sociology
B28	F	21	Education	D48	F	32	Education
B29	F	19	Nursing	D49	M	22	Architecture

TABLE 24

EXPERIMENTAL DATA SUMMARY TABLE GROUP A AND B

Subject	Pre-PS	Post-PS	Pre-CF	Post-CF	Pre-PD	Post-PD	List	Text
A10	76.25	100.75	113	160	22	30	XX	
A11	67.50	81.75	106	134	27	42		XX
A12	91.50	98.75	134	164	34	41	XX	
A13	45.75	62.75	70	88	44	57		XX
A14	59.00	81.50	85	131	17	22	XX	
A15	45.00	56.50	106	139	11	11	XX	
A16	59.00	77.75	87	114	11	11	XX	
A17	67.50	74.75	103	125	44	56		XX
A18	59.75	73.00	98	136	14	21	XX	
A19	79.50	101.75	108	148	26	29	XX	
B20	40.75	51.75	54	60	25	34		XX
B21	75.75	96.25	143	188	12	14	XX	
B22	66.75	73.00	112	152	27	28		XX
B23	57.00	71.00	109	144	45	49	XX	
B24	72.00	81.00	73	92	48	50	XX	
B25	64.75	73.50	63	96	58	31	X	X
B26	61.00	76.25	51	71	59	43	X	X
B27	75.50	77.50	104	122	48	62	X	X
B28	78.75	94.75	108	139	46	50		XX
B29	70.75	84.25	84	104	39	56		XX

TABLE 25

EXPERIMENTAL DATA SUMMARY TABLE GROUP C AND D

Subject	Post-PS	Post-CF	Post-PD	List	Text
C30	41.00	90	26		X
C31	72.00	85	47		X
C32	48.75	56	27	X	
C33	72.00	98	21	X	
C34	43.75	50	25		X
C35	89.00	108	54		X
C36	54.00	45	19		X
C37	64.00	102	37	X	
C38	67.00	105	10	X	
C39	75.75	95	25		X
D40	65.00	105	10	X	
D41	62.00	76	40		X
D42	64.00	75	55	X	
D43	63.75	101	42		X
D44	56.00	66	30		X
D45	64.00	82	14	X	
D46	65.50	96	50		X
D47	67.00	48	36	X	
D48	78.75	79	21	X	
D49	62.50	30	27		X

APPENDIX I

Supplementary Statistical Analysis Summary Tables

TABLE 26

RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PERCEPTUAL SPEED TASK GROUPS A AND B

Group A Subject	Pre-	Post-	Gain	Group B Subject	Pre-	Post-	Gain
A10	76.25	100.75	24.50	B20	40.75	51.75	11.00
A11	67.50	81.75	14.25	B21	75.75	96.25	20.50
A12	91.50	98.75	7.25	B22	66.75	73.00	6.25
A13	45.75	62.75	17.00	B23	57.00	71.00	14.00
A14	59.00	81.50	22.50	B24	72.00	81.00	9.00
A15	45.00	65.50	20.50	B25	64.75	73.50	8.75
A16	59.00	77.75	18.75	B26	61.00	76.25	15.25
A17	67.50	74.75	7.25	B27	75.50	77.50	2.00
A18	59.75	73.00	13.25	B28	78.75	94.75	16.00
A19	79.50	101.75	22.25	B29	70.75	84.25	13.50
Total	650.75	818.5	167.5	Total	663	779.25	116.25
N	10	10	10	N	10	10	10
Mean	65.08	81.85	16.75	Mean	66.3	77.92	11.62

TABLE 27

RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE CLOSURE FLEXIBILITY TASK GROUPS A AND B

Group A Subject	Pre-	Post-	Gain	Group B Subject	Pre-	Post-	Gain
A10	113	160	47	B20	54	60	6
A11	106	134	28	B21	143	188	45
A12	134	164	30	B22	112	152	40
A13	70	88	18	B23	109	144	35
A14	85	131	46	B24	73	92	19
A15	106	139	33	B25	63	96	33
A16	87	114	27	B26	51	71	20
A17	103	125	22	B27	104	122	18
A18	98	136	38	B28	108	139	31
A19	108	148	40	B29	84	104	20
Total	1010	1339	329	Total	901	1168	267
N	10	10	10	N	10	10	10
Mean	101	133.9	32.9	Mean	90.1	116.8	26.7

TABLE 28

OVERALL N'S, MEANS, AND STANDARD DEVIATIONS
PRETEST PICTURE DIFFERENTIATION TASK

Group	N	Mean	SD
A (Row 1)	10	25.00	12.44
B (Row 2)	10	40.70	15.08
List (Col 1)	10	24.00	13.97
Text (Col 2)	10	41.70	12.26
Total	20	32.85	15.68

TABLE 29

OVERALL N'S, MEANS, AND STANDARD DEVIATIONS
POSTTEST PICTURE DIFFERENTIATION TASK ALL GROUPS

Group	N	Mean	SD
A (Row 1)	10	32.00	16.66
B (Row 2)	10	41.70	14.68
C (Row 3)	10	29.10	13.26
D (Row 4)	10	32.50	14.86
List (Col 1)	22	29.32	15.62
Text (Col 2)	18	39.33	12.79
Total	40	33.82	15.11

TABLE 30

RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B

Group A Subject	Pre-	Post-	Gain	Group B Subject	Pre-	Post-	Gain
A10	22	30	8	B20	25	34	9
A11	27	42	15	B21	12	14	2
A12	34	41	7	B22	27	28	1
A13	44	57	13	B23	45	49	4
A14	17	22	5	B24	48	50	2
A15	11	11	0	B25	58	31	-27
A16	11	11	0	B26	59	43	-16
A17	44	56	12	B27	48	62	14
A18	14	21	7	B28	46	50	24
A19	26	29	3	B29	39	56	17
Total	250	320	70	Total	407	437	30
N	10	10	10	N	10	10	10
Mean	25.0	32.0	7.0	Mean	40.7	43.7	3.0

TABLE 31

RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B (LIST)

Group A Subject	Pre-	Post-	Gain	Group B Subject	Pre-	Post-	Gain
A10	22	30	8	B21	12	14	2
A12	34	41	7	B23	45	49	4
A14	17	22	5	B24	48	50	2
A15	11	11	0				
A16	11	11	0				
A18	14	21	7				
A19	26	29	3				
Total	135	165	30	Total	105	113	8
N	7	7	7	N	3	3	3
Mean	19.28	23.57	4.28	Mean	35	37.67	2.67

TABLE 32

RESPONSE CHANGES ACROSS TWO ADMINISTRATIONS OF THE PICTURE DIFFERENTIATION TASK GROUPS A AND B (TEXT)

Group A Subject	Pre-	Post-	Gain	Group B Subject	Pre-	Post-	Gain
A11	27	42	15	B20	25	34	9
A13	44	57	13	B22	27	28	1
A17	44	56	12	B28	46	70	24
				B29	39	56	17
Total	115	155	40	Total	137	188	51
N	3	3	3	N	4	4	4
Mean	38.33	51.67	13.33	Mean	34.25	47.00	12.75

TABLE 33

MEANS AND STANDARD DEVIATIONS FOR PRE- AND POSTTEST PERCEPTUAL SPEED, CLOSURE FLEXIBILITY AND PICTURE DIFFERENTIATION VARIABLES

Variables	N	Mean	SD
Pre- Perceptual Speed	20	65.69	12.41
Post-Perceptual Speed	40	71.83	14.49
Pre- Closure Flexibility	20	95.55	23.87
Post-Closure Flexibility	20	102.48	35.80
Pre- Picture Differentiation	40	32.85	15.29
Post-Picture Differentiation	40	33.82	14.92

TABLE 34

INTERCORRELATIONS OF PRE- AND POSTTEST PERCEPTUAL SPEED, CLOSURE FLEXIBILITY, AND PICTURE DIFFERENTIATION VARIABLES
(Pretest N = 20; Posttest N = 40)

Variables		N	1	2	3	4	5	6
Pre- PS	(1)	20	1.00**	.89**	.59**	.56**	.16	.20
Post-PS	(2)	40	.89**	1.00**	.61**	.73**	-.10	.17
Pre- CF	(3)	20	.59**	.61**	1.00**	.96**	-.43	-.20
Post-CF	(4)	40	.56**	.73**	.96**	1.00**	-.48*	-.00
Pre- PD	(5)	20	.16	-.10	-.43	-.48*	1.00**	.79**
Post-PD	(6)	40	.20	.17	-.20	-.00**	.79**	1.00**

*p < .05
**p < .01

With an N of 40 a correlation coefficient of .32 is significant at the .05 level and .41 is significant at the .01 level. A N of 20 requires a correlation coefficient of .444 for significance at the .05 level and .561 for significance at the .01 level.

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BIOGRAPHICAL SKETCH

Born in Norfolk, Virginia, Eleanor Camp Criswell grew up in Jacksonville, Florida. She graduated from Alfred I. duPont High School of Jacksonville in 1956. After attending Purdue University for a year, she transferred to the University of Kentucky where she received her B.A. in Education in 1961, and M.A. in Counseling and Guidance in 1962.

Mrs. Criswell taught elementary school five years for the Lexington City Schools of Lexington, Kentucky and the Waverly Schools of Lansing, Michigan. On the college level she has taught at Jacksonville University, Santa Fe Junior College, University of Florida, and California State College, Fullerton, California.

She was elected to Kappa Delta Pi and Phi Lambda Theta education honoraries and is a member of the American Association for Humanistic Psychologists, American Educational Research Association, and Friend of Esalen.

Her husband, Dr. Francis M. Criswell, is currently serving as a Naval Flight Surgeon.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Education and to the Graduate Council, and was approved as a partial fulfillment of the requirements for the degree of Doctor of Education.

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